REPORT RESUMES

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PRELIMINARY INVESTIGATION OF COMMUNICATION-LINKED TECHNIQUES FOR OFF-CAMPUS TEACHING OF VOCATIONAL AND TECHNICAL SUBJECTS.

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A DEVELOPMENTAL PLAN WAS ORGANIZED AND PRESENTED FOR A COMPREHENSIVE STUDY OF ALL ASPECTS OF TECHNICAL INNOVATIONS WHICH COULD CONSTITUTE A COMMUNICATION-LINKED SYSTEM FOR OFF-CAMPUS VOCATIONAL AND TECHNICAL EDUCATION. A PRELIMINARY LITERATURE SURVEY REVEALED SEVERAL GENERIC ELEMENTS, BOTH TANGIBLE AND INTANGIBLE, WHICH CONSTITUTE A COMMUNICATION-LINKED CLASSROOM SYSTEM. THE REPORT DESCRIBED A HYPOTHETICAL EXAMPLE OF THE COMMUNICATION-LINKED, CLASSROOM-SYSTEM CONCEPT FOR USE AS A TENTATIVE PLANNING MODEL. OTHER SIGNIFICANT ITEMS PRESENTED IN THE REPORT WERE (1) A BIBLIOGRAPHY OF THE BOOKS AND ARTICLES REVIEWED DURING THE PRELIMINARY SURVEY, AND (2) A DESCRIPTIVE LISTING OF SOME OF THE ESTABLISHED, COMMUNICATION-LINKED, INSTRUCTIONAL SYSTEMS WORTHY OF STUDY DURING A RECOMMENDED, COMPREHENSIVE SURVEY. THE PROCEDURE FOR SUCH A SURVEY WAS EVOLVED, CENTERING ON A QUESTIONNAIRE THAT WAS DESIGNED TO ELICIT IN DETAIL THE DESCRIPTION, PURPOSE, COST FACTORS, RESEARCH ASPECTS, AND PERSONNEL SPECIFICATIONS OF EACH SYSTEM TO BE STUDIED. DEVELOPMENT OF A CATALOG OF SYSTEM CHARACTERISTICS FOR INSTITUTIONAL USE WAS SUGGESTED. A SAMPLE ENTRY FOR SUCH A CATALOG INCLUDED SUCH CHARACTERISTICS AS THE HOME INSTITUTION, FORM OF CURRICULUM, COMMUNICATION VEHICLE, NUMBERS OF STUDENTS INVOLVED, SUCCESS ACHIEVED, ABILITY FOR SYSTEM REPLICATION, AND PARTICULAR ECONOMIC ADVANTAGES. (JH)

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Final Report
Project No. 6-825

PROJECT TITLE

Preliminary Investigation of Communication-Linked Techniques for Off-Campus Teaching of Vocational and Technical Subjects

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SUMMARY OF PROJECT

GRANT NUMBER: OEG-1-6-08254-0819

TITLE: Preliminary Investigation of Communication-Linked Techniques for Off-Campus Teaching of Vocational and Technical Subjects

INVESTIGATOR: Alexander Schure

INSTITUTION: The New York Institute of Technology

OBJECTIVES:

(1) To perform the preliminary literature survey on the various elements of the Communication Linked Classroom System, including methodology, equipment, physical facilities, economics, programmed and other curricular material, psychological factors, student population and academic organization.

(2) To organize a comprehensive survey and evaluation of actual experience in the United States in the operation of various elements of the Communication Linked Classroom System in academic institutions, in industrial and commercial organizations, and in government agencies including DOD and NASA, with particular regard for the implications for technical and vocational education.

(3) To prepare a detailed plan for the execution of such a comprehensive survey and evaluation.

PROCEDURE:

During the course of this investigation, a major effort was expended on the review of the available literature concerned with the myriad factors affecting the elements of Communication Linked Classroom Systems. Several hundred books and articles were reviewed, abstracted, and categorized into the elements pertinent to the Communication Linked Classroom System. These elements include the classroom, the academic center, curricular material, presentation devices, remote communication devices, computer equipment as well as intangible elements including academic organization, course methodology, psychological factors and the economics of the various systems. Appendix A lists the bibliography of those books and articles reviewed during the course of this study.

In addition to a preliminary survey of the pertinent literature, various schools and organizations pursuing some aspect of programmed instruction were also listed as Appendix B with the intent being to visit the more promising ones during a subsequent evaluation program. In order to aid the initial survey of such institutions, a comprehensive questionnaire was prepared to effect rapid response from them. The sample questionnaire is presented in the body of this report.

The information received from the questionnaire would be supplemented by follow-up mail on specific areas of interest, telephone interviews, area conferences, and direct visitations to those centers deemed to be productively engaged in these endeavors.

The results of the wide variety of survey activities eventually would take the form of a catalog incorporating the various communication linked techniques being employed; the academic institutions, industrial and commercial organizations, and government agencies employing such techniques; as well as an evaluation of the effectiveness of such techniques weighed against the economic factors. In the body of this report, sample documents are presented to suggest future format. The utilitarian value of such a compact catalog consolidating all such information is obvious.

Our investigation indicates that the procedural basis for the comprehensive survey should center about the following generic questions:

(1) What is it we want to know?

(2) Where and how are we going to find it out?

(3) After we find it out, what are we going to do with it?

(4) To whom and how are we going to disseminate the pertinent information?

Considering the last question, sample films, sound-slides and sample demonstration lectures could be evolved in follow-up programs to this preliminary investigation to supplement the suggested catalog.

Considering the potential impact of the scope of this program on a wide spectrum of academic institutions from elementary schools through graduate schools, industrial and commercial organizations, and virtually all the government agencies, it follows that it would be most advantageous to assemble an advisory panel consisting of qualified specialists drawn from these functional activities. This special panel would include personnel well versed in the fields of programmed instruction, psychology, education evaluation, engineering systems, and vocational education and would supplement the like activities of staff members of the New York Institute of Technology.

In line with this reasoning, the services of such a group of specialists was sought and the tentative list of those who have been contacted is presented in the body of this report. Their primary function would be to provide constructive criticism of the various methods, materials, and conclusions drawn during the conduct of the comprehensive survey. In some instances, certain members might contribute original thoughts to the study especially in the area of their specialization.

RESULTS AND CONCLUSIONS:

It must be recognized that the current ferment in our society in general, and in education in particular, has revealed three great unmet needs:

(1) Vastly increased education and training for all members of our society.

(2) Truly individualized attention to each student to permit him to realize his full potential and to eliminate the present waste of human resources with its attendant misery and social disruption.

(3) Higher productivity in the teaching and learning process to eliminate the economic barriers to universal education and training and to insure a continuing improvement in the quality of our society.

Considering the limited facilities available and potentially available even after allowing for the frenetic growth plans of our colleges, junior colleges, and vocational schools, it is clear that nowhere near the needed classroom space will exist to accommodate the ever burgeoning population of high school graduates and part time students engaged in full time employment during normal working hours. The above listed needs are applicable to all forms of academic classrooms and campuses, and to the growing array of off-campus training and educational activities designed to reach every segment of the community and every age level of the citizenry.

Recognizing the severe limitations which prevents bringing this student mass to the campus, perhaps an approach might be to bring the campus to the students. Essentially, this preliminary investigation focused on exploring the ways and means to best effect the implementation of "Communication-Linked Techniques for Off-Campus Teaching of Vocational and Technical Subjects." The Communication Linked Classroom might be likened to a modern version of the ancient Socratic system which employed the method of individualizing questions and answers and thus establish an intimate and fruitful teaching relationship between the learned teacher and a small group of "privileged" students. This Communication Linked Classroom would be designed to bring large numbers of students into intimate relationship with the learned teacher and his knowledge, and to provide individualized communication between student and teacher whenever required. It would use modern curricular materials and modern communication technology to provide individually tailored education which is both effective and economical.

In the course of our preliminary investigation, it became clear that there are literally thousands of activities closely related to some segment of Communication Linked Classroom Techniques currently employed in our schools, industries and government agencies. It would seem to be a logical first step to categorize these activities by type of institution, form of curriculum, communication vehicle, numbers of students involved, success achieved, ability to replicate system used, as well as the economic advantages of each system.

A direct result of this preliminary literature survey points to the crying need for a catalog summarizing the factors mentioned above in one consolidated volume. A sample page of such a catalog is presented in the body of this report. The existence of such an opus would prove to be invaluable to existing schools at all levels, new schools currently in the drawing board phase of development, industrial and commercial organizations, and last but certainly not least, government agencies particularly the U. S. Office of Education, the Department of Defense, and the National Aeronautical and Space Administration. The utilitarian value of such a catalog is self-evident, but the single most important element is for a pertinent institution to be able to correlate the various factors involved in a decision of how to teach or train a specific group of students in the most successful and most economical manner.

To best effect such a catalog, a comprehensive survey is envisioned which would allow for a deeper penetration into the available literature and ongoing activities including the most necessary site visits to those institutions deemed to have made substantial progress toward the realization of their specific objectives.

An additional conclusion of this preliminary report is the need to organize a team of New York Institute of Technology staff personnel supplemented by outside consultants in the areas of programmed instruction, psychology, educational evaluation, engineering systems and vocational education to constitute an "advisory panel" for the recommended supplementary investigation. This panel would be chaired by Dr. Alexander Schure, President of the New York Institute of Technology, and in addition to N.Y.I.T. staff personnel, it would include recognized specialists drawn from other academic institutions, government agencies, industrial organizations, and research institutes. As mentioned above, inquiries were made of about twenty such specialists and several acceptances have already been received. The tentative list is included as Appendix C of this report.

The principal function of this advisory panel would be to pass on the effectiveness of any of the specific Communication Linked Techniques, again considering the realization of teaching objective weighed against the economic factors. The panel may be convened as a single group or may work as individuals to perform a designated function. In certain specific instances, a panel member might contribute to the innovative aspect of such an investigation depending on his own specific background and research activities.

The need for a comprehensive study of the application of Communication-Linked Classroom Techniques is clear. It is our conclusion that the evolution of a catalog summarizing and evaluating the critical factors involved in communication-linked techniques including their implications for vocational and technical education would constitute a major contribution to the increased education and training for all members of our society.

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STATEMENT OF PROBLEM

The 20th Century has witnessed a burst of scientific discovery that has revolutionized man's working life. The introduction of automation and computer technology into industry and government has radically altered the nature of work. As a consequence, more is being demanded of man in terms of his mental prowess rather than manual labor. Therefore the increasing need for adequate personnel to maintain the new technologies and to further research is most felt in educational circles where educators are hard put to train enough people to meet this need.

Coupled with this, the democratic spirit of the American people has traditionally fostered education as the path to increased opportunity and prosperity. America has espoused the principle of education for all, and as work is being upgraded by technology, favoring the educated, more citizens are clamoring for learning for themselves and their children.

In view of these pressures for quality education, more educational institutions are turning to technical innovations in order to produce an expansion of educational opportunities.

Science and technology, steadily developing since the Industrial Revolution, changed many aspects of American society. Medicine, transportation, communication, modes of production and consumption are just a few of the areas which have been radically altered in the process. It is ironical that education and methods of learning should be one of the last institutions to benefit by the direct application of science and technology.

However, education could not escape the critical eye of science. Educational psychology put to the test many of the old theories of learning. Many myths about how people learn are now being questioned. For instance, many feel that the doctrine of formal discipline*, one of the first theories to be questioned has been proven unsound, and in some cases shown to impede the learning process.

Rewards for learning were demonstrated to be more beneficial than punishment. The principle of reinforcement in learning was thus developed; a principle now indispensable in all segments of instructional technology from programmed learning to C.A.I. (Computer Assisted Instruction).

The implications of computer development for education and communication were quickly realized. Thus the computer has the potential of becoming involved in all aspects of the educational process. A computer can solve problems and it can also teach. Linear computer assisted instruction has developed into the highly refined branched computer assisted instruction. The computer can present programmed material in sequence from least difficult to most difficult or it can branch off into specific areas in a sequence, to suit the individual's needs. In addition, computers have begun to be used in educationally related areas such as registration, grading, presentation and scoring of exams, class scheduling and attendance. At Harvard University there is a project currently under study which is attempting to computerize their library system.

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* Theory of Formal Discipline: Justifying the study of a subject not for its own sake but for the training it supposedly gives the mental faculties.
Example: Studying Latin not to learn Latin but to improve the mental faculties.

The ramifications of these computer research innovations into education will tend to drastically alter the methods of instruction in the near future.

Other significant innovations include educational T.V., films, slides, taped lectures, language laboratories, programmed texts, teaching machines, slide and movie projectors, telephones, picture phones, telautograph machines, and teletypewriters. Many more technical devices have been produced, all for the purported purpose of facilitating the learning process.

In order to make optimum use of all of these technical innovations, it is necessary to apply a systems approach. Isolated and individual uses of any of these technical innovations, although helpful in certain situations, would lack the planning and integration necessary in order to approach optimum efficiency at realistic cost. In addition, many of the technical innovations cited above are interdependent, and consequently work best when used in conjunction with one another. What is desired then is a Communication-Linked Classroom System, implying as it does advanced facilities planning as well as integration of curricular materials, presentation devices, communication systems information retrieval equipment and computer equipment.

In order to develop the basis for an effective Communication Linked Classroom System, it id desirable to survey and evaluate the considerable body of experience available to date in the techniques and practices pertinent to the Communication-Linked Classroom System.

It is the purpose of this preliminary study to present a detailed plan of a project to assemble and evaluate information on all aspects of the Communication-Linked Classroom System.

The information assembled will include virtually all aspects of instructional media innovations from their physical characteristics to research results on their effectiveness.

The project proposed is one of assembling and evaluating data. All of the technical innovations, including all of their diversified uses results in an overwhelming amount of information to be surveyed and evaluated.

At present there is no available comprehensive survey and study of all aspects of technical innovations which could constitute a communication-linked system. There have been listings of various techniques in instructional media, a government sponsored survey of programmed instruction and its specific applications in public schools throughout the nation*, various reviews and/or abstracts of new research within the instructional media area published in most of the professional journals and reviews in the field**. All of these are important and helpful, but are limited in scope and applicability, especially where the non-media-specialist is concerned.

A definitive compendium of information on techniques and innovations in this field would represent a significant contribution as a source book for individuals in schools, industrial and vocational training institutions, and government and military agencies.

* Center for Programmed Instruction 1962, 1963
1962 - Programs '62: A Guide to Programmed Instructional Materials
1963 - The Use of Programmed Instruction in U. S. Schools

** Most notably Audiovisual Instruction and AV Communication Review

As a point of comparison, in the 1940's, the field of psychological testing became burdened with a variety of psychological and educational tests. It was extremely difficult for educators and administrators to cope with the plurality of tests available and their appropriatness for individual use. Accordingly, the Buros' Mental Measurements Yearbook* was developed to describe and evaluate tests in the field. It is a source book widely used by psychologists and educators today.

In much the same way, a source book is needed in educational technology as an aid to professionals and non-professionals in determining the feasibility of various techniques for systems incorporation in a particular setting. Keeping up-to-date about new innovations constitutes a tremendous problem, even for the specialist. The difficulties are compounded when laymen are not only expected to be aware of these innovations, but also to pass judgment on their present and future usefulness and applicability.

Such a situation need not continue to exist. Means are available to alleviate the problem. The plan suggested here for this purpose is an ambitious one, but well within the scope of the available resources, materials and personnel to insure successful completion.

Under this plan, a comprehensive survey of communication-linked techniques would provide the basis for a definitive catalog and evaluation.

* Buros, Oscar K., Sixth V. Mental Measurements Yearbook
New Brunswick: Rutgers University Press, 1963
Published 6 times (6th Yr. Bk.)

The catalog will include the various elements of the Communication-Linked Classroom System, including methodology, equipment, physical facilities, economics, programmed and other curricula materials, psychological factors, student population and academic organization.

Any thorough catalog of this nature demands an equally comprehensive method of evaluating the material contained therein. At this stage in the development of instructional media, coming to terms with the problem of evaluation from both a methodological and procedural standpoint is essential.

Where required, on-site investigations will be made. If on-site inquiries are not required, a detailed questionnaire (copy enclosed) requesting information about the innovation will be sent to those institutions where the techniques are being utilized or demonstrated.

A special panel of consultants will be organized, including specialists in programmed instruction, audio-visual techniques, psychology, engineering systems, and vocational and technical education. Individuals comprising the panel will make critical comments and recommendations on the techniques being reviewed. This procedure should insure as comprehensive an evaluation as possible. The evaluation will be constructed so as to be easily understood by the non-media-specialist, including any individuals who could benefit by its use. It will provide them with pertinent information concerning procedures for implementation. Recommendations concerning methods of such innovations will also be included.

In addition to a description of the nature and purpose of the technique being considered, the evaluation described in this proposal will include detailed information on research, cost factors, and personnel specifications.

Refined methods of evaluating the effectiveness and applicability of technical innovations in education are essential to insure the validity of any results obtained. Any technical innovation introduced into any aspect of the educational process must have at the outset some detailed procedure for testing its effectiveness as compared to some criterion measure, such as the conventional method of instruction.

The evaluation proposed here, including on-site or questionnaire inquiry in addition to critical comments provided by leading authorities, will devote extensive time and space to obtaining and listing accurate information concerning relevant research.

An important aspect of this evaluation is that in considering specific innovations, it will emphasize the unique experience of the particular institution to which the innovation was adapted. When a technique is developed it is usually perfected and tested under as ideal conditions as possible. But when other institutions wish to adopt the technique to their facilities, conditions often fall short of this ideal. Therefore, a critique of the setting in which the technique was developed will be valuable in determing its potential usefulness in different situations.

For the school administrator, industrial training administrator, government or military agency director, specific information concerning many and diverse uses of technical innovations is most useful. These individuals, perhaps not media specialists, want and need these kinds of data, which are not readily available to them. In all probability they would lack the time and technical ability to effectively research and understand journal abstracts for technical information. In addition, they would not be in a position to evaluate such data. The evaluation proposed here would provide such persons with a perceptive overview of the many technical developments and their potential uses.

The catalog and evaluation will also provide valuable information on cost factors. Cost is one of the most substantial obstacles to implementation of new techniques in education. The problem is compounded by the lack of information available in this area. With current demands for more and better education, the question of increased efficiency at realistic cost becomes crucial. Accurate cost estimates of various aspects of developing and implementing new methods and techniques must be made accessible to institutions and agencies desiring them.

Some of the problems of cost which will be dealt with in the evaluation are:

a) the relevant costs of the innovation;

b) the approximate cost "curve" of expanding the use of the validated techniques and methodologies developed;

c) the hardware costs and software costs considered separately;

d) the general availability of replacement parts and components; and

e) the institution or agency responsible for funding the project.

In addition to relevant research and cost factors, the catalog and evaluation will contain significant data on personnel specifications. Information about technical personnel needed to effectively implement and follow through with new innovations in education is extremely important. The essential nature of such information should be obvious. Lacking personnel specifications, and more importantly, personnel to fill those specifications, any systematic attempt to introduce any new technique into any type of curriculum might result in decreased efficiency, effectiveness and possible failure. Because the evaluation proposed here will include pertinent information on personnel specifications, in many instances such difficulties could be alleviated.

OBJECTIVES AND HYPOTHESES

It is reasonable to accept the hypothesis that our nation is feeling the intense pressure to provide some form of post-high school education to a major portion of our high school graduates, as well as an opportunity for those workers engaged in non-skilled or semi-skilled occupations to escalate their skills and consequently improve their earning positions. It is also reasonable to assume that if every institution of higher learning were to miraculously double their faculties, their facilities, their laboratories and capital expenditures overnight, they would merely begin to satisfy the educational needs of this potential hoard of students.

The make-up of this swelling student population can be established first by analyzing the needs of high school graduates. Some 25 years ago, something of the order of 10% of the graduating high school students sought some form of higher education. This figure has swelled to more than 50% this year, and may grow to some 65% before 1980. Secondly, those workers engaged in marginally skilled occupations are vulnerable to the ever increasing threat posed by the inevitable growth of "automation" which has become an economic necessity for the survival of most of our industries. Their plight might best be summarized succintly by a recent statement made by one of our investigators, Edwin F. Shelley, who said at a speech at New Paltz, New York, "Within our lifetime, there will be no jobs for people who cannot perform more creatively than machines."

Thus, accepting the hypothesis that the existing campuses are not in a position to accept the numbers of potential students desiring higher educational opportunities, the logical course is for the campuses to reach many of these students at their homes, places of work, or community centers.

The fantastic growth of technology in communications enlivens the prospect of linking the campus to these potential students at the above noted places. The means for such communication are varied and include such vehicles as teaching machines; written programmed instruction with referrals to texts along with diagnostic tests; closed circuit television; audio and video tapes; telephones and tele-writers, in addition to formal lectures and tutorial sessions. As far as laboratory experience is concerned, this might be done at a suitably equipped industrial organization, or where not feasible, students could achieve such experiences at odd hours at an appropriate institute of higher education. The experimental procedures and requirements could be organized in such a manner as to permit the students to complete their required laboratory work during evenings, afternoons, weekends or in concentrated doses during summer months.

The need for communication linked classrooms is a direct result of the ferment in our society in general, and in education in particular. The need may be summarized as follows:

(1) Vastly increased education and training for all members of our society.

(2) Truly individualized attention to each student to permit him to realize his full potential and to eliminate the present waste of human resources with its attendant misery and social disruption.

(3) Higher productivity in the teaching and learning process to eliminate the economic barriers to universal education and training and to insure a continuing improvement in the quality of our society.

These requirements apply to all academic classrooms and campuses, and to the growing array of off-campus training and educational activities designed to reach every segment of the community and every age level of the citizenry.

It is toward these objectives that this preliminary investigation of communication-linked techniques for off-campus teaching of vocational and technical subjects was directed. The objectives bounded these specific tasks:

(1) To perform the preliminary survey on the various elements of the communication-linked classroom system including methodology, equipment, physical facilities, economics, programmed and other curricular material, psychological factors, student population, and academic organization.

(2) To organize a comprehensive survey and evaluation of actual experience in the United States in the operation of various elements of the communication-linked classroom system in academic institutions, in industrial and commercial organizations, and in governmental agencies, including the Department of Defense and the National Aeronautical and Space Agency with particular attention to the implications for technical and vocational education.

(3) To prepare a detailed plan for the execution of such a comprehensive survey and evaluation.

DESCRIPTION OF ELEMENTS OF THE SYSTEM

The preliminary literature survey conducted revealed several generic elements which constitute a Communication-Linked Classroom System. They may be characterized as tangible elements and intangible elements.

I. TANGIBLE ELEMENTS

(A) Classroom Location and Size

1. On Campus
    a) Academic Buildings
    b) Dormatories
2. Off-Campus
    a) Industrial Plants
    b) Department Stores
    c) Banks
    d) Union Halls
    e) Community Centers
    f) Evening Schools

(B) Curricular Material

1. Programmed Material
    a) Branching
    b) Linear
2. Standard Textbooks
3. Audiovisual Material
    a) Slides
    b) Movies
    c) TV Taped Lectures
    d) Taped Lectures
    e) Sound Slide Lectures
    f) CCTV Lectures
    g) Language Laboratory Material
4. Dial Access Information Retrieval Material
5. Computer Assisted Instruction Material
6. Miscellaneous Experimental Demonstration Material

(C) Presentation Devices

1. Teaching Machines
    a) Branching
    b) Linear
2. Reading Practice Machines
3. Matched Pair Devices
4. Audiovisual Equipment
    a) Slide Projectors
    b) Movie Projectors
    c) TV
    d) Tape Players
5. Dial Access Information Retrieval System
6. Information Retrieval Material For Use With Central Library

(D) Remote Communication Devices

1. Telephone, Picturephone, Telautograph
    a) 2-Way for Individual Communication
    b) 1-Way for Illustrated Lectures to Large Groups
2. Card Readers for Diagnostic Examinations
3. Teletypewriters
    a) For Examination Replies
    b) For Computer Assisted Instruction Terminals

(E) Computer Equipment

1. Record Keeping
2. Diagnostic Examinations
3. Direct Instruction of Student Via CAI Programs

(F) Academic Center Design and Staffing

II. INTANGIBLE ELEMENTS

(A) Academic Organization

(B) Methodology for Various Types and Levels of Students and Courses

(C) Psychological Factors

1. Learner Motivation
2. Frustration
3. Interplay Between Student and Teacher
4. Interplay Between Student and Student

(D) Economics of Various Systems

A glance through the bibliography, included in this report as Appendix A, will reveal several hundred books, articles and other references relating to ongoing activities encompassing one or more of the above listed elements of a Communication-Linked Classroom System. Some 150 publications were abstracted and close to another thousand were cursorily reviewed and listed for future study in detail. On the basis of this limited literature survey, it is reasonably safe to presume that many of the ongoing activities will have a relatively brief half-life and will be superseded by more promising and/or economical system elements.

As Dr. Davis* points out "...On the assumption that the process of learning and applying new techniques and theories has not changed over the years, it is probable that most of the state-of-the-art techniques and immediately available skills now utilized in system design are interim measures and that a basic theory covering the varied aspects of system design is already evolving and will supplant many of the mispractices and misuses of system design now tolerated and condoned."

Although Dr. Davis' remarks were concerned primarily with military control systems, they are generic enough to include the specific application to Communication-Linked Classroom Systems.

In order to illustrate the elements of such a Communication-Linked Classroom System without introducing the thousands of available examples drawn from the literature, let us hypothesize such a system.

* Davis, Ruth M., "Techniques of Information System Design" Proceedings of the First Congress on the Information System Sciences, Hot Springs, Va., November 1962

The Hypothetical Communication-Linked Classroom System (Figure 1.)

The Classroom

Consider a new type of classroom located on a college or high school campus, or off-campus in an industrial plant, a bank, a department store, a union hall, or a community center. Twenty or thirty students of various ages, interests and accomplishments are in attendance at any given time, but they are all learning different things. They are sharing the same classroom because of the special facilities and services available.

Also in attendance in this special classroom is a pleasant and helpful teacher-aide who assists each student to understand the various facilities, schedules their assignment, adjusts the equipment, distributes individual materials and establishes communication via telephone and other lines with the specially staffed academic center which this classroom shares with a score of other classrooms. Before discussing the special academic center, let us explore a bit further the activity and facilities in the new type of classroom which we have been describing.

Upon embarking on his chosen course of study, each student is assigned by the aide to his own study carrel -- desk, chair, bookcase, cabinet and cartridge loading tape machine. He is provided with an appropriate study syllabus, programmed and regular text books, initial material for study and for supplementary reading, and instruction by the aide in the use of the equipment and services of the classroom. He is particularly advised that he can speak with his teacher at any time by requesting the use of a communication desk.

Communication Linked Classroom System

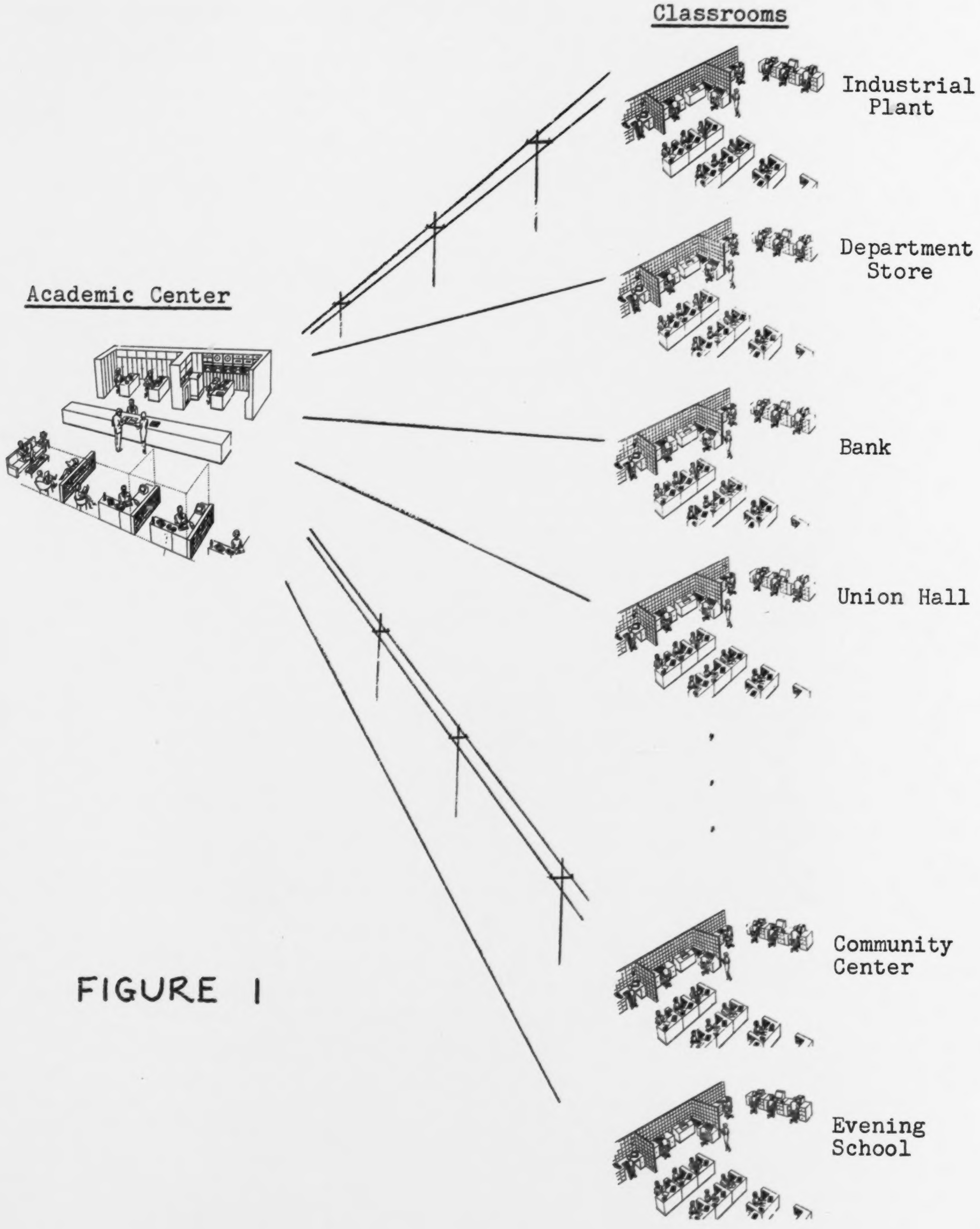
Classrooms
Academic Center
Industrial Plant
Department Store
Bank
Union Hall
Community Center
Evening School

FIGURE 1

In addition to the individual study carrels, the classroom is equipped with one or more units of each of the following:

1) A communication desk from which a student may converse individually with his teacher at the academic center. This desk is shielded from sounds in the other parts of the classroom and contains a two-way hands-free telephone, a two-way telautograph (remotely operated pen) which serves as a blackboard on which the student and teacher may sketch and write while both observe simultaneously, and a two-way picture-phone (closed circuit television) in those instances where the cost of coaxial or micro-wave connection between classroom and academic center is justified. Either the student or the teacher may request a conference, and the scheduling is arranged by the aide.

2) An examination scoring station in which the student may insert an IBM card on which he has entered the answers to short-answer, diagnostic examination questions. The station reads and transmits the answers to a computer at the academic center, and the computer instantly tells the student at the scoring station what his grade is, what questions he answered incorrectly,

and what study material he should consult in order to remedy his lack of knowledge on these questions. All of this information is provided to the student instantly, in printed form for his own use, on a standard computer print-out unit. The central computer retains a record of the student's examination performance for diagnostic purposes.

3) A self-contained, cartridge loading sound motion picture projector for individual student viewing of single concept films, demonstrations, lectures and study material which is best illustrated with the aid of motion pictures. Alternatively, video tape presentation on a television screen can be used where the cost of this technique is justified by the materials available.

4) A self-contained, cartridge loading film strip projector, with sound, for individual student viewing of material with high visual content but little need for motion.

5) A teaching machine of the AutoTutor type for individual study of material which is available in adequately validated programmed form.

6) A sound-shielded audio tape recorder station for individual practice in connection with the study of speech and languages.

7) An automatic library request desk at which the student or the aide may teletype a request to the academic center for any material -- printed, taped or audio-visual -- which will be required for future study or for remedial work. The request is immediately acknowledged by the academic center and is filled by mail or by direct (overnight) print-out on the library teletypewriter or on the print-out unit in the examination scoring station.

The Academic Center

The academic center controls the quality of the education and training offered by the system. It provides direction to the student in his self-paced studies, it provides the books and other materials required by the curriculum, it provides tests and examinations and appropriate remedial material and assistance. And most important, it provides constant consultation and supervision for each student by a staff of competent and sympathetic teachers.

Each teacher is responsible for 3 or 4 courses in his field, and supervises every student taking one of his courses. The courses are organized to encourage student self-pacing, and to provide automatic test scoring and computer-directed remedial assignments.

Hence the teacher can provide (via the communication channels outlined above) his personal consultation and assistance to each student whenever it is required desirable, and can supervise several times the number of students ordinarily supervised by one teacher in the standard classroom format.

Orientation lectures may be taped by the teachers, and provided to each student for use at appropriate stages in his self-paced course of study. The student can then converse with the teacher in person (via the communication desk) to clarify or discuss the lecture, and of course a student may arrange to speak with his teacher at any time that he feels the need for explanation, assistance or confirmation in the course of his study. The teacher may, of course, initiate communication with the student for examination or tutorial purposes.

The academic center is the teachers' base of operation. It houses his office and his clerical assistance. It houses his special communication desk, similar to the one in each classroom but with provision for recording and editing lectures. It houses the central library service which provides all of the study materials and supplementary matter to the students, either by mail or by direct teletype or print-out. It houses administrative personnel and appropriate material production facilities.

The academic center also houses a most important tool for minimizing the teacher's drudgery and maximizing the teachers' effectiveness -- namely, the central academic computer. This computer maintains each student's records, charts his progress, scores his routine tests and examinations, diagnoses his difficulties, provides remedial material and references, and advises the teacher -- periodically or on command -- of his student's problems, progress and status.

With the continuing trend toward lower costs in the storing and processing of large amounts of data, it will become economically feasible to provide more and more course material directly from the central computer, and to allow the student further access to the computer for help in programming his studies, and in obtaining reference, remedial and supplementary material.

The Classroom (Figure 2.)

A) Students at their desks -- reading, writing and listening (through earphones) to lecture material reproduced on their individual tape machines.

B) Student at Communication Desk speaking by hand-off telephone with teacher at Academic Center, and simultaneously writing on Telautograph "blackboard." Writing is reproduced at teacher's desk simultaneously. Closed circuit TV camera and screen are also indicated.

C) Student at Library Request Desk teletyping a request to the Academic Center for materials needed for future study.

D) Student at Examination Scoring Station about to insert IBM card on which he has answered examination questions. Correct answers, examination score and references for further study will appear on print-out machine to his left.

E) Teacher-Aide

F) Student at Language Laboratory Station for speech work.

G) Student using cartridge slide projector.

H) Student at cartridge motion picture projector station.

I) Student using AutoTutor programmed instruction machine.

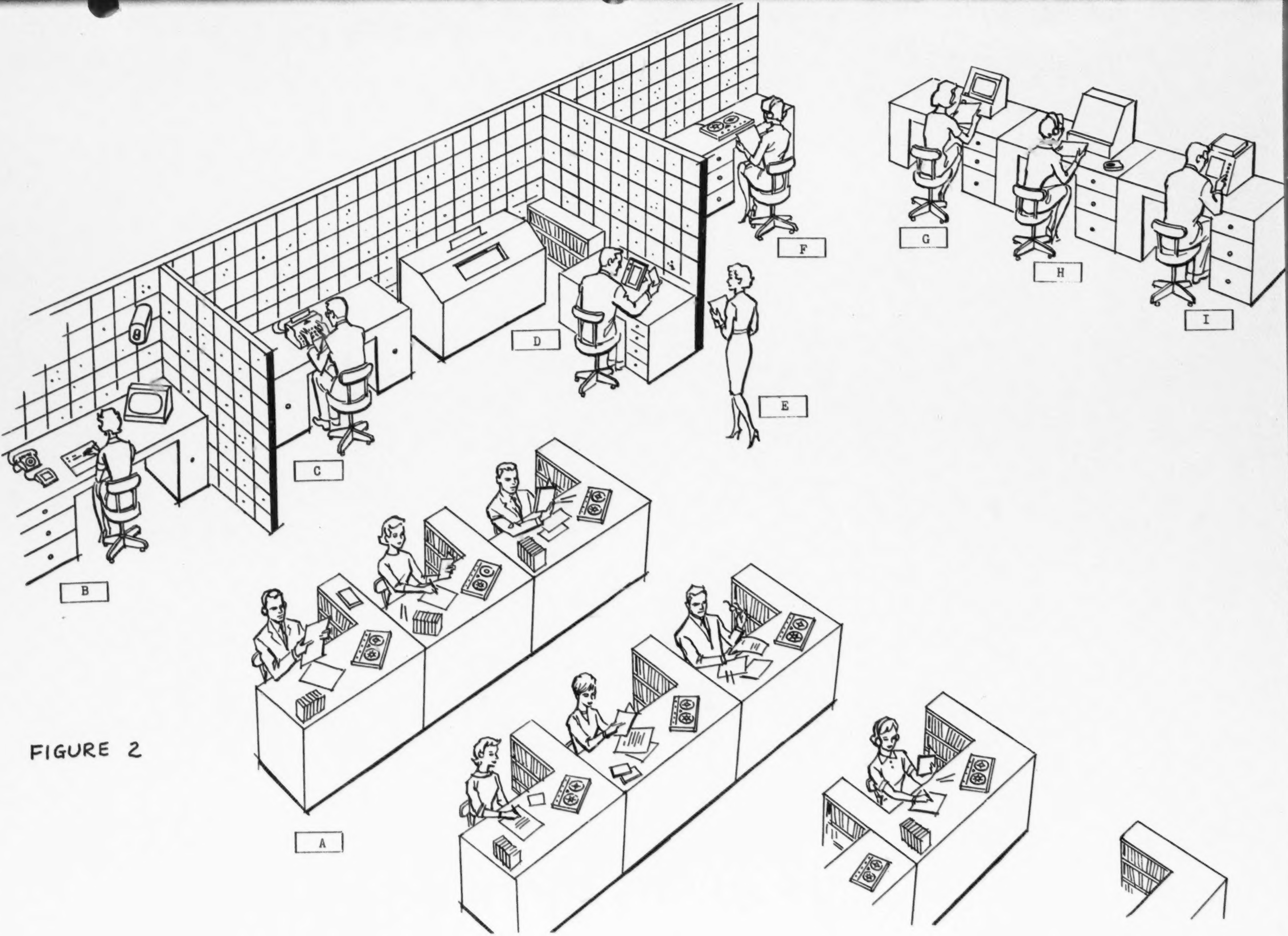

FIGURE 2

The Academic Center (Figure 3.)

A) Teachers using Telautograph "blackboards" at their Communication Desks while speaking with students via hands-off telephone. Tape equipment for recording lectures, and closed circuit TV equipment also indicated.

B) Faculty lounge.

C) Teacher requesting student record from Computer Center.

D) Teacher requesting curricular material from Library/Production Center.

E) Clerk preparing material at Library/Production Center.

F) Clerk answering teletyped classroom request for library material.

G) Computer operator working at desk in Computer Center.

The Communication-Linked Classroom System described and illustrated is included to serve the purpose of vividly tying together the manifold elements constituting the system. When the comprehensive survey outlined in this report is completed, it should be possible to design specific Communication-Linked Classroom Systems to meet specific educational and training requirements.

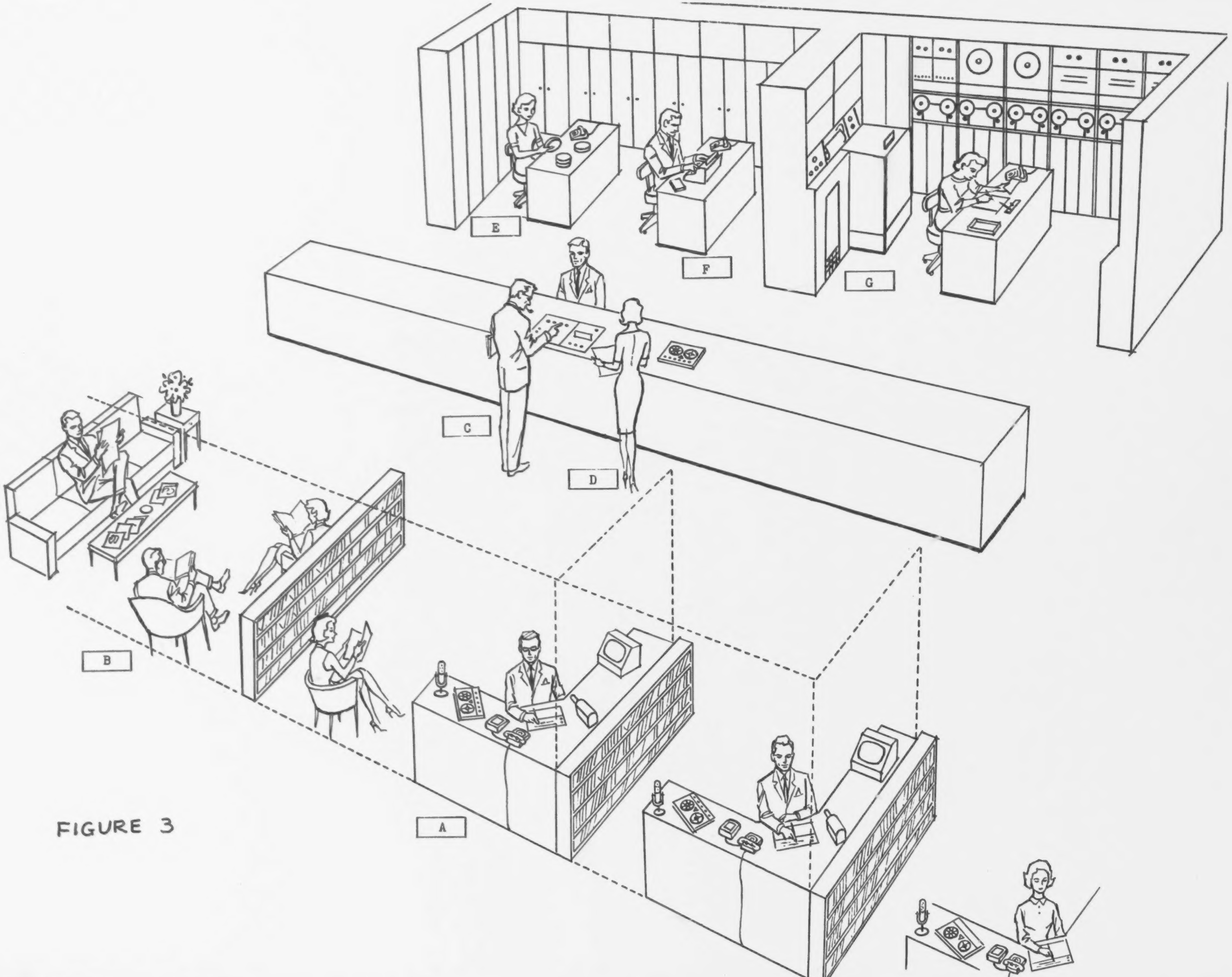

FIGURE 3

ANALYSIS

The literature reviewed during the course of this preliminary investigation of communication-linked techniques for off-campus teaching of vocational and technical subjects centered about the use of new educational media techniques toward the solution of the crucial problem of how our society is going to provide quality education to the masses currently shut out of institutes of higher education.

Some 150 articles were abstracted and some 900 other books and articles were cursorily reviewed with the thought of delving into them more deeply in a follow-up program. These references are included as Appendix A of this report.

A limited number of activities engaged in some aspect of Communication-Linked Classroom Techniques is listed under Appendix B.

It is patently beyond the scope of this preliminary study to perform the essential evaluation of the referenced techniques as this would require considerably more funds and time to do so. However, the procedure for such an evaluation has been evolved and centers primarily on a detailed questionnaire which is included herein. The questionnaire considers in some detail the description, purpose, cost factors, research aspects, and personnel specifications of each innovative technique and the institution pursuing it.

It is accepted that the information culled from the questionnaire would frequently be insufficient to make a proper evaluation. In many instances site visits, follow-up mail, telephone interviews and area conferences may be required to determine the full significance of the technique being pursued.

For the purpose of this report, a single innovative technique has been chosen to illustrate the format of a page of the proposed catalog of communication-linked classroom techniques. To simplify problems of geography for so short a time period as covered in this report, an activity in metropolitan New York was chosen.

The Catholic Diocese of Brooklyn and the International Business Machines Corporation have joined together on a telephone linked computer experiment designed to make homework easier. Six high school students were selected for this experiment. Each student had a push button phone linked to the computer. By pushing suitable buttons, the student would instruct the computer to add, substract, multiply, divide or perform a square root operation. The computer gives the answer by voice using the voice answer-back control.

The computer is located at the IBM Center in Yorktown, New York some fifty miles from the students' homes in Brooklyn, New York. In effect, the computer provides each student with the equivalent of a versatile desk calculator in his own home.

This innovation is presented in the form of an item in the proposed catalog of communication-linked classroom techniques.

The reader can extrapolate this single entry into a full catalog encompassing all the elements of the communication-linked classroom system.

SAMPLE CATALOG ENTRY

INNOVATION: Consumer Dataservice System, Home Calculation

PROJECT DIRECTORS: Brother Austin David, F.S.C. data processing consultant for the Catholic Diocese of Brooklyn working in conjunction with Roger C. Greenhalgh, manager of technical planning for I.B.M.'s Advanced Systems Development Division

DATE STARTED AND COMPLETED: February, 1966 - June, 1966

PURPOSE:

The Catholic Schools Diocese of Brooklyn and the International Business Machines Corporation have undertaken a project to test the feasibility of having students use audio response or "voice-answerback" systems in their home to assist them with their homework. Six students participated in this joint project to see how well they could communicate with a computer from their homes using a push-button telephone. The IBM 1710 computer located at the company's Mohansic Systems Laboratory in Yorktown Heights, New York, responded by voice.

It is hoped that by employing the audio-response system, routine but time consuming operations like multiplying numbers or finding a square root can be taken care of by the computer, thus freeing the students to be able to do more problems and getting more practice in setting them up.

DESCRIPTION:

The audio response units operate much like phonograph records in that what the questioner hears is the playback of a pre-recorded voice. Words and sounds are magnetically recorded and stored on drums or on disks and are played back in a sequence directed by instructions from the computer. The computer can assemble a wide variety of different messages.

One unit being used in the joint home computing experiment being conducted by IBM and the Catholic Schools Diocese of Brooklyn is a modified version of the first commercially available audio response unit -- The IBM 7770 announced in January 1964. The 7770 puts answers together from individual words recorded on a magnetic drum.

The second audio response unit is an experimental device that stores complete phrases up to 12 seconds long on magnetic disks. This unit allows the computer to select a complete message in a single operation.

Another specially-developed audio response unit is a basic element of the New York Stock Exchange's quotation service. A member broker can ask for market data on a particular stock by dialing a series of numbers on his telephone. After finding the answer in its files, the computer will respond by assembling a message from its pre-recorded vocabulary.

The six students involved in this project put the computer to work on problems in algebra, chemistry, physics, trigonometry, bookkeeping and accounting. During February of 1966, the students received several hours of classroom instruction on how to use the service.

In those areas where push-button telephone service is not yet available, the telephone company connected accessory push-button "pads" to dial phones in the students' homes for the test period. The dial phone is used to call the computer, and the pad is used to enter problems. With 12 buttons instead of the usual 10, the pad serves for entering both numbers and a range of commands.

In addition to the operation commands -- add, subtract, multiply, divide and square root -- half a dozen other instructions were available to the students.

By pressing the right buttons, a student could verify what numbers he had entered, correct a number, cause a number or an answer to be stored in the computer for use in future problems, or ask for a message to be repeated.

Besides the usual 10 push-buttons for numerals 0 through 9, the 12-key version has an asterisk, or star, key and a plus key.

Numbers are entered by keying them in the usual way, as if "dialing" a phone number. Each key also has a second meaning, either an operation such as "multiply" or an instruction such as "keep". A plastic card or "overlay" fits over the keyboard to show the special meanings for each key.

To enter an operation or an instruction, the user presses the appropriate key and then presses the star key. For example, to say "multiply" the user presses the multiply key and then the star key. To store a number for later use, the user presses the "keep" key, the start key, and then the single digit designating the location where the number is to be stored.

The keep instruction is very useful where numbers will be used repeatedly of where the answer to one calculation is to be used in a following calculation.

COST FACTORS:

This being a limited demonstration program (ended June 30, 1966) actual cost factors are different from those that would be encountered in practical use. The program was funded by IBM and an approximate budget including programming, machine time, personnel, etc. was $100,000.

In calculating costs for replication, the number of students must be divided into the sum of the costs for the following:

1. Touchtone Pad
2. Extra Telephone Charge
3. Time on 7770 Computer
4. Audio Response Unit
5. Data Set
6. Personnel Costs

RESEARCH:

Six students in the Catholic Schools Diocese of Brooklyn took part in the project which terminated on June 30, 1966.

Three girls and three boys took part in the project. The students were screened and selected on the basis of diversity of backgrounds, family income, neighborhood location, age and academic achievement.

The project represented a "Feasibility Study" and not an experimental study as such. Consequently no experimental results will be published. Extensive records were kept however, and according to Brother Austin David, F.S.C., "All indications are that the project was successful. The project has demonstrated that a form of computing service can be provided anywhere through an inexpensive push-button telephone."

Publications dealing generally with the feasibility of this use of the audio response unit will be forthcoming now that most of the data analysis is being completed.

PERSONNEL SPECIFICATIONS:

To set up this project, it was necessary to utilize the skills of specialists in computer programming, human factors engineering, psychology, and education. Mr. Roger C. Greenhalgh, manager of technical planning for IBM's Advanced Systems Development Division, headed the project for IBM. Brother Austin David F.S.C., Data Processing Consultant for the Roman Catholic Diocese of Brooklyn, directed the project for the Catholic Schools Diocese of Brooklyn.

Generally, once the materials have been programmed and equipment purchased or rented, the cost for transmission and maintenance is minimal.

FUTURE OF TECHNIQUE:

According to IBM News (Vol. 3, No. 8, April 25, 1966) there are wide applications for the new system as described above.

A sampling of the services such a system might offer to consumers includes:

- Automatic maintenance and balancing of the family checkbook and instant information on the status of financial obligations.
- Home selection and purchasing of goods shown in a catalog or displayed on the TV screen with costs automatically charged to the buyer's account.
- A storehouse of historical and current information on every imaginable subject -- an automated encyclopedia, dictionary, almanac, library and shelf of catalogs rolled into one.
- Education -- youth and adult courses on all conceivable subjects in pictures and sound.

QUESTIONNAIRE

Title of Innovation:

Name of Institution where Innovation is being used or tested:

Name(s) of individual(s) responsible for the management of the project; including, the nature of their responsibility, their qualifications and specific functions in relation to the technique being surveyed:

Date Started/Date Ended:

I. PURPOSE

a) Why was the technique or method instituted?

b) Is the project unique? If so, explain how, why and to what extent?

c) Does the innovation purport to increase the performance and the efficiency of existing and/or new educational procedures? How?

d) What are the explicit and implicit anticipated results?

e) Is this a demonstration project? What is being demonstrated? Provide a short description.

II. DESCRIPTION

a) Description of the specific technique, method, process or technology being used or tested.

b) Description of institution where the technique is being used or tested.

c) Description of physical facilities into which the technique is being incorporated.

III. COST FACTORS

a) What are the relevant costs?

b) What are the present alternative uses of equipment and programs which are already developed?

c) To what extent are the dollar costs allocated to actual functions?

d) What is the approximate cost "curve" of expanding the use of the validated techniques and methodologies developed in the project?

e) How are the hardware costs separated from the software costs?

f) What is the general availability of replacement parts and components?

g) To what extent can the validated process be economically replicated?

h) To what extent can parts of the process be replicated without the use of sophisticated equipment and/or the use of highly skilled personnel?

i) Describe how and under what circumstances the software materials can be adapted to other educational equipment, media and situations?

IV. RESEARCH

a) Is the innovation part of any research project, or is any research being conducted on the new technique at the institution in question?

b) If so, what is the purpose of the research being done?

c) What specific hypothesis or hypotheses are being tested?

d) What kind of experimental design has been worked out to test the hypothesis(es)? Please elaborate.

e) How can the effectiveness of the technique be measured?

f) What are the goals of the innovation which are specifically related to evaluating the process?

g) Has the effectiveness of the innovation been systematically compared with conventional techniques or methodologies?

V. PERSONNEL SPECIFICATIONS

a) What are the special qualifications and capabilities of the personnel involved in the project, and what allocation of their professional time is devoted to this particular innovation?

b) What specific specialties are required to maintain this project?

c) What is the general availability of such specialists?

d) How is a new institution proposing to duplicate a particular innovation going to obtain specialists and talents which they presently may not have?

e) What levels of skills will be required of the institutional participants not directly involved in managing the innovation? How easily can the necessary skills be taught?

CONCLUSIONS AND RECOMMENDATIONS

As a result of this Preliminary Investigation of Communication-Linked Techniques for Off-Campus Teaching of Vocational and Technical Subjects, it can be concluded that there exists a pressing need on the part of our nation to:

(1) Vastly increase the education and training for all members of our society.

(2) Provide truly individualized attention to each student to permit him to realize his full potential and to eliminate the present waste of human resources with its attendant misery and social disruption.

(3) To realize higher productivity in the teaching and learning process to eliminate the economic barriers to universal education and training and to insure a continuing improvement in the quality of our society.

In order to realize these goals in the face of an admitted critical shortage of classroom facilities, qualified teachers and laboratory equipment at our institutes of higher education, an innovative form of communication between the institution and the student must be evolved.

The Communication-Linked Classroom System concept, one example of which is described in the body of this report, can be an answer to this problem. The hundreds of activities culled from the preliminary literature search indicate the extent of interest already existing in our nation. The problem remains to put these myriad elements of the system into a form useful to schools, industrial organizations, and governmental agencies.

Therefore, we recommend the conduct of a comprehensive survey and evaluation of actual experience in the United States in the operation of various elements of the Communication-Linked Classroom System in academic institutions, in industrial and commercial organizations, and in government agencies including DOD and NASA, with particular regard for the implications for technical and vocational education.

The value of such a survey is self-evident and would provide a most useful tool for existing schools at all levels, new schools currently in the drawing board phase of development, industrial and commercial organizations, and government agencies, particularly the U. S. Office of Education, the Department of Defense, and the National Aeronautical and Space Administration.

APPENDIX A

LIST OF PUBLICATIONS ABSTRACTED

1. AID. Published monthly by The Institute of International Research and Development, Inc., Educational and Training Methods Division, P. O. Box 4456, Lubbock, Texas.

   Presents industry-wide news and research reports in the field of automated instruction.

2. Alexander, F. D. "Teaching Fundamental Concepts of Mathematics at the College Level by Closed-Circuit Television," Mathematics Teacher, 56: 627-31, December, 1963.

   Discusses a research project conducted with fundamental mathematics students at the George Peabody College for Teachers to determine if there is a significant difference between learning of fundamental mathematics concepts at the college level via closed circuit TV as opposed to conventional teaching. The study concluded that there was no difference in mean achievement between the sections receiving TV lectures and those receiving classroom instruction.

3. Andereck, Paul A., et al. The Feasibility of a Cooperatively-Owned Multi-Purpose, Multi-Channel, Closed Circuit Television System For Instruction, Materials Distribution, and Administrative Data Handling. St. Louis, Mo.: Instructional Materials Center, Audio-Visual Department, Cooperating School Districts of the St. Louis Suburban Area, October, 1965, (NDEA Title VII Project No. B-472).

   This report presents a detailed evaluation of the factors contributing to the design and evaluation of the feasibility of a multi-purpose TV system for direct instruction, transmitting instructional materials, and fulfilling administrative input-storage-retrieval requirements of a group of St. Louis School Districts.

4. Audiovisual Instruction. Published monthly except July and August by the Department of Audiovisual Instruction, NEA, 1201 16th St., N.W., Washington 6, D. C.

   This is the official Journal of the Department of Audiovisual Instruction. Reports on the latest trends and developments in the educational media field including programmed instruction, language laboratories, new uses of Ed. TV, etc. Prints special issues on the application of these media to subject-matter areas.

5. AV Communication Review. Published quarterly with two supplements by the Department of Audiovisual Instruction, NEA, 1201 16th Street, N.W., Washington 6, D. C.

Reports on research, experiments and studies in the communications field. Includes regularly a Department on Programmed Instruction, Ed. by A. A. Lumsdaine.

6. Barhyot, Gordon C. An Operating Test of a Pilot Educational Media Research Information Center. Cleveland, Ohio: Center for Documentation and Communication Research, School of Library Science, Western Reserve University, September, 1965. (NDEA Title VII Project No. B-170b).

Presents research results and discusses techniques and procedures regarding the development of the Educational Media Research Information Center by the Center for Documentation and Communication Research of the School of Library Science of Western Reserve University.

7. Barson, John, et al. "Standard Operating Procedures For a Learning Resources Center: A System For Producing Systems," Audiovisual Instruction, Vol. 10, No. 5, May, 1965, p. 378-379.

Describes one aspect of a two-year USOE Study, A Procedural and Cost Analysis Study of Media in Instructional Systems Development, being conducted at the Audiovisual Center and College of Business at Michigan State University.

The article describes how the Michigan State University Study has designed a means to bring the cumulative know-how of professors and specialists to bear on instructional problems, A System For Producing Systems.

This developmental system is designed to serve as a prototype set of procedures for other institutions to examine, adopt, and refine in light of their human and learning resources.

8. Beaird, James H. and Standish, John T. Audiostimulation in Counselor Training. Oregon: Teaching Research Division, Oregon State System of Higher Education, December, 1964. (NDEA Title VII Project No. 1245).

This study attempted to compare and evaluate the effectiveness of a counselor training program using a simulated counselling interview (tape recording of a client's response) versus conventional counseling interviews employing role playing techniques.

9. Beckmeyer, Theodore. "Application of Programmed Instruction to Remedial Reading for the Deaf," Volta Review, 65: 415-17, October, 1963.

The purpose of this project was to discover if programmed materials not specifically designed for the deaf could be used to teach reading to deaf children who are retarded in their reading by one or more years.

10. Behr, Eldon A. "A New View In The Lab: Using a Rear Projection Screen to Teach Science," *Audiovisual Instruction*, Vol. 9, No. 10: 531-534, October, 1964.

Describes the use of a rear projection screen in the teaching of science. The unique feature of the setup described in this article is that it allows the classroom to be lighted while the picture is shown, which cannot be done with a front-projection screen. In addition, the short-projection-distance lens permits the use of a large screen without mirrors or an involved optical system. Finally, the screen can be designed so that it will not interfere with room working areas when it is not in use.

11. Bitzer, Donald L., et al. "The Uses of Plato: A Computer Controlled Teaching System," *Audiovisual Instruction*, Vol. II, No. 1: 16-21, January, 1966.

Describes *PLATO*, the automated teaching system developed by the Cordinated Science Laboratory at the University of Illinois. The *PLATO* system utilizes a high-speed digital computer as the central control element for teaching a number of students simultaneously, while still allowing each student to proceed independently through the lesson material.

12. Blackman, Leonard S. and Smith, Marshall P. *The Development and Evaluation of a Curriculum for Educable Mental Retardates Utilizing Self-Instructor Devices of Teaching Machines*. Bordentown, N. J.: Johnstone Training and Research Center, Department of Instructions and Agencies, State of New Jersey, February, 1964 (NDEA Title VII Project No. 368).

The purpose of this study was to investigate the effectiveness of self-instructional devices in the teaching of educable mentally retarded young adolescents in primary reading and arithmetic. The results of the study were essentially negative.

13. Braunfeld, Peter G. "Problems and Prospects of Teaching With a Computer," *Journal of Educational Psychology*, Vol. 55, No. 4, 201-211, 1964.

This paper reports on the use of the computer-based *PLATO II* system to teach a group of undergraduates some topics in computer programming. Examples of how data can be sorted, processed, and interpreted are given. Economic feasibility and future plans are discussed.

14. Brazziel, William. "The Revolution in Materials For Undereducated Adults," Audiovisual Instruction, Vol. II, No. 4, April, 1966, p. 254-256.

Provides general background information on the need for new and better materials for adult education and a description of some of the materials available as well as guidelines for evaluating materials.

15. Briggs, Leslie J., et al. Investigations of Thinking Via Self Instructional Programs. Palo Alto, California: American Institute For Research, June, 1964 (NDEA Title VII Project No. 1002).

The purpose of this project was to utilize programmed instruction to stimulate increased thinking activity on the part of the student and, in addition, to gain information concerning the nature of thought process and how they might be stimulated.

16. Brish, William M. Washington County Closed Circuit Television Report. Hagerstown, Md.: Board of Education of Washington County, 1964.

The purpose of this project is to explore and evaluate the potential of closed-circuit television for instruction on a county-wide basis. The project is funded by the Fund For The Advancement Of Education and The Ford Foundation, with equipment provided by the Electronic Industries Association.

17. Brown, James W. and Norberg, Kenneth. Administering Educational Media. New York: McGraw-Hill Book Co., 1965.

A general introduction to the field of administration and supervision of the New Media. Contains in its 16 Chapters details about facilities planning, current trends in the planning of learning spaces, as well as additional resources to consult for further data.

18. Brown, James W. "Student Response Systems," Audiovisual Instruction, Vol. 8, No. 4: 214-219.

In this article the author describes several efforts to develop workable procedures and devices within the Student Response Systems area. In addition, he describes the characteristics of several Student Response Systems now in production. Among those considered are the SDC (System Development Corporation) Computer-Based Class Unit; The Student Response Monitor; The Tele-Quest or TV Intercommunication System; The Tele-Test Communication System; The Tele-Prompter Classroom Responder; and, The Edex Teaching System.

19. Brown, James W., et al. *A-V Instruction: Materials and Methods*, 2nd Ed. New York: McGraw-Hill Book Company, 1964.

A text designed to help prospective and practicing teachers become properly acquainted with the broad range and interrelated uses of instructional materials and techniques.

20. Brown, James W. and Thornton, James W., Jr. *New Media in Higher Education*, Washington, D. C.: Association For Higher Education and The Division of Audiovisual Instructional Service of The National Education Association, 1963, p. 182.

This work contains a comprehensive survey of the present character of the uses now being made of the New Media by colleges and universities throughout the nation. Reports and findings on 90 outstanding undertakings from over 40 colleges and universities are included. In addition, a general rationale of the new media in education is offered. Also, critical questions are posed on the relationships of audiovisual practices to aims and purposes of higher education.

21. Brugger, John R. *A Survey of Television Equipment and Facilities Used For Purposes of Instruction by Public Schools, Colleges and Universities*. Hagerstown, Md.: Board of Education, Washington County, N. D. (NDEA Title VII Project No. B-004).

This report surveys and evaluates technical equipment and facilities used in television installations established by selected public school systems, colleges and universities.

22. Buley, Hilton. "Multimedia Systems of Instruction," *Audiovisual Instruction*, Vol. 10, May, 1965, p. 391-393.

Describes the systems approach to instruction instituted at Southern Connecticut State College.

23. Bushnell, Donald D., Ed. "The Automation of School Information Systems," *DAVI Monograph #1*, 1964, p. 136.

A collection of papers dealing with a wide range of computer applications to instruction and administration.

24. Bushnell, Donald D. "The Role of the Computer in Future Instructional Systems," *AV Communication Review*, Supplement No. 7, Vol. 11, No. 2, March-April, 1963.

Deals with computer fundamentals, computer-based teaching machines and simulation, and in addition, a look to the future of such techniques.

25. Campeau, Peggie L. Level of Anxiety and Presence or Absence of Feedback in Programmed Instruction. Palo Alto, California.: American Institute For Research, February, 1965 (NDEA Title VII Project No. 1155).

Using the test anxiety scale for children. This study sought to evaluate the effects of anxiety level on learning and to measure the effect of presence or absence of feedback in programmed instruction on learning and retention level.

26. Carpenter, C. R. "Can TV Replace the Teaching Machine?" Audiovisual Instruction, Vol. 9, No. 5; 281-283, May, 1964.

Describes the results of a research project conducted at the Pennsylvania State University, the purpose of which was to explore possibilities for using closed-circuit television as a main component in a teaching machine system for mediating programmed learning.

27. Carter, Roy E., Jr. and Clarke, P. A Field-Experimental Study of the Functions of Educational Television For Its Audiences With Special Reference to the Potential Role of Children in Stimulating Family Use of This Medium. Minneapolis: Communication Research Division, School of Journalism, University of Minnesota, June, 1964 (NDEA Title VII Project No. 891).

This study attempted to discover if children will influence the family pattern of watching educational television programs. This study noted the degree of influence exerted on the child in the classroom, and this indirect influence of the school on family attitudes.

28. Case, H. W. and Roe, A. Basic Properties of an Automated Teaching System. Report No. 64-29. Los Angeles: Department of Engineering, University of California, June, 1964 (NDEA Title VII Project No. 635).

This project attempts to provide a comprehensive model of the generalized automated teaching system, to describe this model in mathematical terms and determine the magnitude of the constraints, and to explore the computer functions in an automated teaching system.

29. Center For Programmed Instruction. Programs '62: A Guide to Programmed Instructional Materials Available to Educators By September, 1962. Washington, D. C.: U. S. Government Printing Office, 1962, p. 406 (Office of Ed. Pub. #OE 34015).

An annotated Bibliography of Programs with Eight Statistical Summaries.

30. Clemens, Thomas D., Ed. Research Grants and Contracts Involving Teaching Machines and Other Self-Instructional Media. Washington, D. C.: U. S. Department of Health, Education, and Welfare, Office of Education, 1963, p. 45.

Abstracts as of June 30, 1962. The extramural research projects on programmed instruction and teaching machines, supported under the new educational media program, Title VII of the National Defense Education Act and the Cooperative Research Program, Public Law 531.

31. Conant, Theodore R. "Closed Circuit at Harvard," Audiovisual Instruction, Vol. II, No. 1, January, 1966, p. 24-26.

The author discusses the future prospects for a network of coaxial cables and amplifiers now being installed at Harvard University which will soon provide the university with a multichannel closed-circuit system capable of handling computer information, television signals, and other electronic data.

The author points out how such a system could revolutionize library systems all over the world. He points out "that it will soon be possible to record half a million pages or documents on a single roll of video tape. Given the right command, a computer system can search that tape or any one of thousands of other tapes or rolls of microfilm and reproduce any given page on a television screen where it will remain as long as anyone wants to use it. If desired, the page can be photocopied in seconds. When the image is no longer needed, it vanishes on command. Nothing has been removed from the stacks or taken out of file. The same data is instantly available to the next seeker. A computer can handle hundreds of requests for information simultaneously."

32. Cook, H. Robert. The Effects on Learning of Structural Drills in Spanish Broadcast Via High Frequency AM Radio. Bloomington: Indiana University, January, 1964, (NDEA Title VII Project No. 1018).

Describes a study conducted at Indiana University where students taking elementary Spanish were equipped with small transistor radios which enabled them to receive language drills at almost any time or any place. The author hypothesized that because these students would be exposed to more hours of contact with the language materials, that this greater exposure would enable them to obtain a higher proficiency in the spoken language.

33. Coulson, John E., et al. Non-Program Variables in the Application of Programmed Instruction. Santa Monica, California: System Development Corporation, July, 1965 (NDEA Title VII Project No. 1268).

The purpose of this project was to assess the contribution of three non-programmed variables: Diagnostic Information, Student Control and Experimenter Augmentation.

34. Coulson, John E., Ed. Programmed Learning and Computer-Based Instruction. New York, New York: John Wiley and Sons Inc., 1962, p. 306.

A collection of papers presented at the Conference on Application of Digital Computers to Automated Instruction, held in Washington, D. C., on October 10-12, 1961, sponsored by the Personnel and Training Branch and the Information Systems Branch of the Office of Naval Research and System Development Corporation. In general, the papers deal with: (a) Theory and Experimentation in Programmed Learning (b) Computer Based Inst. Systems and (c) Computer Technology in Automated Teaching.

35. Crossman, David and O'Brien, Cpt. Frank. "The Classroom Communicator," Educational Communications Convocation Proceedings. Albany: Proceedings of the New York State Convocation on Educational Communications, Division of Educational Communications, New York State Education Department, November 22-25, 1964.

Discusses classroom communicator equipment installed and used in the East Greenbush Junior High School and the West Point Military Academy. Via individual consoles it was possible for each student to electrically respond to multiple choice items, etc. Also discusses the future of these innovations.

36. Dawkins, Peter B. Programmed Instruction and Low Altitude Aerial Observation. HUMRRO Research Report 14. Fort Rucker, Alabama: U. S. Army Aviation, Human Research Unit, December, 1964.

Describes a study, the purpose of which was to prepare, administer, and evaluate an automated mode of presenting training materials for low altitude aerial observers. A series of programmed texts was developed to teach the aerial observers knowledge and skills in four areas of low altitude aerial observation.

37. DeBernardis, Amo. "Media, Technology, and I.M.C. Space Requirements," *Audiovisual Instruction*, Vol. 10, No. 2: 107-110, February, 1965.

Points out that the planning and remodeling of schools must make allowances for new developments in Instructional Media. In addition, the school instructional materials center should be an important aspect of this future development. It should be designed to facilitate the quick and inexpensive incorporation of new developments in technology and media.

38. DeBernardis, Amo, et al. *Planning Schools For New Media*. Portland, Oregon: Portland State College, Division of Education, 1961.

Presents essential information for planning schools to utilize modern teaching technology. Includes special recommendations and specifications for instructional materials centers, classrooms, language laboratories, auditoriums, multipurpose rooms, intercommunication systems, and radio and television installations.

39. DeCecco, John P. *Educational Technology*. New York: Holt, Rinehart and Winston, 1964.

According to the editor, "The purpose of this collection of readings is to bring together research reports and theoretical discussions of psychologists and educators who have contributed to the knowledge about educational technology, programmed learning, and the psychology of learning."

40. de Kieffer, Robert E., Ed. *The Title VII Research Seminar*. Boulder: University of Colorado, 1960, (NDEA Title VII Project No. B-083A).

This report presents the proceedings of a three-day seminar on media research representing 12 States in the Rocky Mountain-Plains Region.

41. *Department of Audiovisual Instruction, NEA*. *Research Abstracts and Analytical Review of Completed Projects. National Defense Education Act, Title VII*., Installment 1, p. 32, Installment 2, p. 23, Installment 3, p. 20, and Installment 4, p. 33.

Abstracts of the completed projects supported under the New Educational Media Program, Title VII, NDEA.

42. Deterline, William A. An Introduction to Programmed Instruction. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962, p. 131.

Discusses programming in relation to learning theory, the historial development of programmed instruction, and the methods of programming.

43. Diamond, Robert M. The Use of Multi-Media Instructional Materials Within the Seminar. Report 5, Office For The Study Of Instruction. Coral Gables, Florida: University of Miami, July, 1964.

The purpose of this study was to determine whether specially selected and designed audiovisual materials could help facilitate discussion in a seminar situation.

44. Diamond, Robert M., Ed. A Guide to Instructional Television. New York: McGraw-Hill Book Company.

Educators actively employing the medium of instructional television illustrate specifically how TV may be used effectively in numerous areas of the curriculum, such as typing, art, anatomy, etc. The book covers nearly all phases of educational television from problems of selections of systems through possible applications.

45. Dorland, James R. "Media Bolsters an Adult Education Program," Audiovisual Instruction, Vol. 11, No. 4, April, 1966, p. 257-259.

Describes how the Canton, Ohio, Public School System cooperated with the media (T.V., Radio, Newspapers), in promoting and selling adult education, and in addition, how the media contribute to the actual teaching-learning process.

46. Fine, Benjamin. Teaching Machines. London: Oak Tree Press, 1963.

A general introduction which covers the whole range of teaching machine innovations, from complex teaching machines with built-in computers to a simple textbook of unusual layout.

47. Finn, James D., et al. A Selective Bibliography on New Media and Instructional Technology. Los Angeles: School of Education, University of Southern California, April, 1964 (NDEA Title VII Project No. B-390).

A selective bibliography on new media and instructional technology containing 584 references. Included are references to publications of the Technological Development Project of the National Education Association (1960-63).

48. Finn, James D. and Perrin, Donald G. Teaching Machines and Programmed Learning, 1962: A Survey of the Industry. Washington, D. C.: U. S. Government Printing Office, 1962, p. 85 (Office of Education Pub. #OE-34019).

A directory of teaching machines, (illustrations of programs), publishers, and manufacturers.

49. Fry, E. B.; Bryan, G. L.; and Rigney, J. W. "Teaching Machines: An Annotated Bibliography," AV Communication Review, Supplement 1, Vol. 8, No. 2: 1-80; 1960.

Includes a summary of teaching machine devices, an annotated bibliography, and a listing of commercially developed teaching machines.

50. Fry, Edward B. Teaching Machines and Programmed Learning: An Introduction to Auto-Instruction. New York, New York: McGraw-Hill Book Co., Inc.,

Describes the various kinds of teaching machines, and how to write and use programs. Includes samples of programming with comments from authorities in the field.

51. Fry, Edward. Teaching Machines and Programmed Instruction. New York, New York: McGraw-Hill Book Co., 1963.

An excellent introduction to programmed learning. The author discusses such questions as, basic considerations in programmed instruction; methods of presenting programmes; methods of writing programmes. In addition, Skinner and Holland's approach is given in detail, and the various systems which have developed from this such as the RULEG, frame classification and chaining are described. A further section illustrates the multiple choice programming of Crowder. Dr. Fry also considers the problems involved in defining educational objectives and their evaluation.

52. Goldstein, Harold, Ed. Implications of the New Media for the Teaching of Library Science. Champaign: University of Illinois, Graduate School of Library Science, Monograph Series, 1963.

This book is a detailed report of a workshop conducted in May, 1963 at the University of Illinois by the Media Research and Development Committee of the Library Education Division, American Library Association.

53. Gotkin, Lassar. "Teaching Machines and Programmed Instruction: The Machine and The Child," *AV Communications Review*, Vol. 14, No. 2: 221-241, Summer 1966.

Discusses the role and future of the new teaching machines or what the author calls the "second machine revolution." The critical issue now is that of programming. According to the author, "if the teaching machines of the 'second machine revolution' are valid and exciting teachers, it will be because those who have programmed them have given them interesting personalities and made use of their unique attributes in unique ways."

54. Gray, Gordon L. "Language Laboratory Serves Announcing Course," *The NAEB Journal*, Vol. 23, No. 1: 14-24, January - February, 1964.

Describes the use of the language laboratory at Michigan State University for training students studying to be announcers.

55. Goering, Oscar J. "Audio Shop Assistant," *Audiovisual Instruction*, Vol. 11, No. 2: 110-112, February, 1966.

Describes how Robert K. Jackson, an industrial arts teacher at Tamenend Junior High School, Central Bucks School District, Warrington, Pennsylvania, uses machines as teacher assistants, ascribing to them duties which aid the teacher, enhance his program, and make learning more interesting and effective.

56. Goldberg, Albert L. "First Steps In The Systems Approach," *Audiovisual Instruction*, May, 1965, Vol. 10, p. 382-384.

Discusses general notions about ed. systems. Describes the systems approach in Livonia, Michigan. The author points out the system approach, offers educators a logical (and a psychological) technique for analyzing, coordinating, and controlling the complex of interrelated factors which contribute to the output - the educated people.

57. Goldberg, Myles H., et al. "Comparison of Programmed and Conventional Instruction Methods," *Journal of Applied Psychology*, Vol. 48, p. 110-14, April, 1964.

Using an industrial setting this study compared the efficiency of the learning process of clerical trainees by means of two different methods of programmed instruction (textbook and teaching machine). The study compared these methods with each other and with conventional classroom technique; noting immediate and delayed recall, time required to learn, and the learners attitude toward the instructional method.

58. Gottschalk, Gunther H. "Closed-Circuit Television In Second Semester College German," Modern Language Journal, Vol. 49, No. 2, 6 pp., February, 1965.

This project attempted to investigate the advantages of presenting basic foreign language materials by means of television lectures and also to identify student attitudes toward the television procedures.

59. Grant, Theodore S. and Merrill, Irving R. Television in Health Sciences Education. San Francisco: San Francisco Medical Center, University of California, September, 1963. (NDEA Title VII Project No. 064).

The purpose of this project was to experiment with and develop new and more effective techniques for training teachers in and presenting academic subject matter through the special media of TV and video tapes in health science.

60. Green, Edward J. The Learning Process and Programmed Instruction. New York, New York: Holt, Rinehart and Winston, Inc., 1962, 233 pp.

Discusses programming techniques and learning principles, including definitions, basic conditioning processes, motivation, programmed instruction, teaching machines, techniques of programming, evaluation and problems.

61. Gryde, Stanley K. "The Feasibility of Programed Television Instruction," AV Communication Review, Vol. 14, No. 1: 71-90, Spring 1966.

The author points to the possibility of effectively combining instructional television and programmed materials.

62. Guba, Egon and Wolf, Willavene. Perception and Television: Physiological Factors of Television Viewing. Columbus: The Ohio State University Research Foundation, 1964. (NDEA Title VII Project No. 875).

The purpose of this study was to develop an experimental system for recording of eye movement data, to collect and analyze these data in order to identify relevant variables and to develop hypotheses about eye movement responses. And finally, to relate these variables and patterns to specific stimulus and subject characteristics.

63. Hartman, Thomas F. "Computer Assisted Instruction," *Audiovisual Instruction*, Vol. 11, No. 1., January, 1966, p. 22-24.

This article describes a project underway in the Instructional Systems Development Department at IBM Thomas J. Watson Research Center, Yorktown Heights, New York. The purpose of the project is to develop, implement, and evaluate new techniques to allow the utilization of digital computers in the instructional process.

64. Hayes, Robert B., et al. *Immediate Standarized Learning Reinforcement To A Complex Mental-Motor Skill (Driver Training) Using Electronically-Coordinated Motion Pictures*. Harrisburg, Pa.: Harrisburg City Schools, N. D. (NDEA Title VII Project No. 1090).

Using a multistation motion picture electronic driving trainer which provided immediate standardized feedback this study sought to evaluate its educational effects on student drivers compared to conventional driver education. Their experimental design was unique in that it provided for an experimental group using a combined programmed and conventional ("integrated") training.

65. Henderson, John. "Using Mirror TV to Teach Speaking," *National Association Of Educational Broadcasters Journal*, Vol. 23, No. 6: 53-56, November - December, 1964.

Describes a project conducted during the spring of 1964 by the Purdue University Television Unit, in which, in addition to conventional instructional TV, a method was devised for recording student performances. The term "Mirror TV" adequately describes how this method simply reflects or mirrors the student's performance via an accurate videotape recording.

66. Hilliard, Robert L. "*New Directions In Educational Broadcasting*," Audiovisual Instruction, Vol. 11, No. 1, January, 1966, pp. 13-15.

Describes educational television today, future prospects for ETV, and new directions for educational radio.

67. Hoban, Charles F. *Determinants Of Adult Enrollment In Television College-Credit Courses, Part I: Social Characteristics and Reactive Behavior*. Philadephia: Institute of Cooperative Research, University of Pennsylvania, 1964, (NDEA Title VII Project No. 1028).

This study sought to identify by means of questionnaire method some variables associated with persistent enrollment in telecast courses and to identify attitudes associated with preferences for on-campus courses as opposed to telecast courses.

68. Hocking, Elton. Language Laboratory and Language Learning. Monograph No. 2., Washington, D. C.: Department of Audiovisual Instruction, National Education Association, 1964. (NDEA Title VII Project No. B-069b).

This monograph is a definitive review of the place of the language laboratory in language teaching. It is a non-technical report, concerned more with the educational functions of the language laboratory, rather than its mechanical aspects.

69. Holland, James G. and Stolurow, Lawrence. "Evaluating Automated Teaching: A Debate," Teachers College Record, 63, No. 1.: 56-70, October, 1961.

Presents two viewpoints on the criteria for evaluating programs and self-instructional devices.

70. Holland, James G. and Skinner, B. F. An Analysis of the Behavioral Process Involved in Self-Instruction With Teaching Machines. Cambridge, Mass.: Harvard University, N. D. (NDEA Title VII Project No. 191).

This work consists of a collection of 17 published and unpublished papers dealing with teaching of young and retarded children, rationale for the need for teaching machines, new teaching machine research, and use of prompting and repetition in the teaching-machine program.

71. Hopkins, Kenneth D. and Lefever, D. Welty. "Comparative Learning and Retention of Conventional and Instructional TV Methods," AV Communication Review, Vol. 13, No. 1.: 28-37, Spring, 1965.

Describes a study conducted by the University of Southern California concerned with the evaluation of a closed-circuit ITV project at the Anaheim City School District, in California.

The purposes of the study were to compare the achievement and long-term retention of elementary school pupils taught conventionally and with ITV.

72. Hughes, J. L. Programmed Instruction For Schools And Industry. Chicago, Illinois: Science Research Associates, Inc., 1962, 299 pp.

Describes programmed instruction, its uses in business and industrial training, and the methods of writing programs.

73. Humphrey, R. E., et al. Study of Model Matching Techniques for the Determing of Parameters in Human Pilot Models: Report on Task 1 Linear, Time-Invarient Models. California: Space Technology Laboratories, Inc., Redondo Beach, 1963 (NASA-CR-56373; Rept.-8426-6002-RV-000).

This report describes the results of an investigation of automatic computer techniques for determining the patterns of human pilot models in tasks where the pilot's performance can be described by a linear, time-invarient model.

74. Hunt, William A. and Mathis, Claude. The Use of Programmed Instruction in Introductory Psychology for Teachers. Evanston, Illinois: Northwestern University, N.D. (NDEA Title VII Project No. 1075).

This study attempted to investigate the relationship between relevant and irrelevant course content in using the teaching machine and programmed textbook method of presentation.

75. Johnston, Roy J. "University of Miami Learning and Instructional Resources Center," Audiovisual Instruction, Vol. 11, No. 2,: 91-93, February, 1966.

Describes the Learning and Instructional Resources Center of the University of Miami at Coral Gables, Florida. The center was designed to ensure utilization of every aural and visual aid to instruction in an effort to maximize the impact of quality teaching through imaginative use of audio and video illustration.

76. Kama, William N., et al. The Use of Auditory Feedback in Simple Remote Handling Tasks. Ohio: Aerospace Research Labs, Wright-Patterson AFB, Ohio Behavioral Science Laboratory, May, 1964.

A study concerned with the use of auditory feedback in tasks requiring simple remote handling.

77. Kelley, C. Fred. "The Efficacy of Television in the Schools," Educational Communications Convocation Proceedings. Albany: Proceedings of the New York State Convocation On Educational Communications, Division of Educational Communications, New York State Education Department, November 22-25, 1964.

The author of ETV station WNDT in New York City, traces the historical development of ETV from 1956 when the City of Pittsburgh Schools pioneered school TV of the 1st community-sponsored ETV Station, WQED. The author concludes that the role of ETV will be extremely important in the future.

78. Kemp, Jerrold E. National Workshop on Educational Media Demonstrations. San Jose, California: San Jose State College, October, 1962 (NDEA Title VII Project No. B-191).

Describes a workshop, conducted in order to develop teams prepared to give visualized presentations demonstrating the applications of the new educational media. The purpose was to plan and produce a kit of materials suitable for presentation throughout the U. S.

79. Kinder, James S. Using Audio-Visual Materials in Education. New York: American Book Company, 1965.

A general text, offering an overview of materials and utilization techniques.

80. Komoski, P. I. "Development of 'Programed' AV Instruction for Television," Educational Communications Convocation Proceedings, Albany: Proceedings of the New York State Convocation on Educational Communications, Division of Educational Communications, New York State Education Department, November 22-25, 1964.

A brief description of a demonstration project now underway at the Institute of Educational Technology, Teachers College, Columbia University, dealing with the application of self-instructional programming principles to the production of TV lessons.

81. Lambert, Philip, Ed. The Teacher and the Machine. Madison, Wisconsin: Dembar Educational Research Service, Inc. (As published in the June, 1962, issue of the Journal of Educational Research).

Various research papers dealing with aspects of teaching machine innovations and programmed learning are presented in this volume.

82. Langdale, A. Barnett. A Report of the Chelsea Closed Circuit Television Project. New York, New York: New York City Board of Education and Fund for the Advancement of Education, 1962.

The report describes the Chelsea Closed Circuit TV Project, which was able to teach conversational Spanish and English to both children and adults. The feasibility of low-cost CCTV was established, and the Chelsea project has evolved into an active program after initial foundation funding.

83. Lange, Philip C. "Mass Media and Programmed Instruction," Educational Communications Convocation Proceedings. Albany: Proceedings of the New York State Convocation on Educational Communications, Division of Educational Communications, New York State Education Department, November 22-25, 1964.

Discusses the possible applications of programmed instruction to the mass media.

84. Laviana, Donald W. "The Modern Magic Lantern," Audiovisual Instruction, Vol. 9, No. 5,: 218-220, April, 1964.

The author describes the uses of the "Audio Multiplexed TV Teaching System," a new technique whereby latent levels of intelligence are overlayed on the communication signal in the form of multiplexed voices." In the employment of this technique, the student's response to the visual presentation excites one of a multiplicity of audio channels of communication, providing a somewhat individualized answer suited to the student's need."

85. Leith, G.O.M., Ed. "Teaching By Machine: A Review Of Research," Educational Research, 5: 1-22, June, 1963.

A review of studies dealing with programmed instruction with and without teaching machines. It was found that programmed instruction in general brings about as much or more learning as conventional instruction.

86. Levens, A. S. Teaching the Fundamentals of Orthogonal Projection: A Study In The Film Presentation Of The Thought Model Method. Berkeley: College of Engineering, University of California (NDEA Title VII Project No. 686).

The purpose of this study was to investigate students' and teachers' use of films which present a method of teaching visualization and manipulation of three-dimensional mental concepts to college engineering students.

87. Lewis, Philip. The Communications Center - New Concept in Instructional Systems, (A Paper) presented at a Programmed Learning Systems Symposium, Columbus, Ohio, May 18, 1965.

Discusses communications systems planning as it applies to instruction and administration. Stresses the necessity of planning the total system at the outset in order to eliminate rapid obsolescence and to permit progressive expansion of the system.

88. Lewis, Philip. *Educational Television Guidebook*. New York: McGraw-Hill Book Co.

Covers the field of educational and instructional television, particularly from the system, equipment, and educational point of view.

89. Luke, Robert A. "Literacy Through Television," *Audiovisual Instruction*, Vol. 11, No. 4, April, 1966, pp. 260-262.

Describes *Operation Alphabet*, which consists of 100 half-hour television programs, designed to help the functional illiterate learn basic reading and writing skills. *Operation Alphabet* was developed by the Philadelphia Public Schools, School Extension Division, in conjunction with Philadelphia's television station, WFIL.

90. Lumsdaine, A. A. "The Developing of Teaching Machines and Programmed Self-Instruction," *New Teaching Aids For The American Classroom*. Washington, D. C.: U. S. Government Printing Office, 1962, pp. 136-173. (Office of Ed. Pub. #OE 34020).

Describes briefly the historical development of teaching machines and the characteristics of programming of verbal subject-matter. Some of the topics discussed include: the construction of programs; automated teaching of non-verbal skills; the use of small steps in teaching procedural skills, etc.

91. Lumsdaine, A. A. and Glaser, R., Eds. *Teaching Machines and Programmed Learning: A Source Book*. Washington, D. C. Department of Audiovisual Instruction, NEA, 1960, 736 pp.

A collection of papers on self-instructional devices and programs grouped as follows: Pressey's Self-Instructional Test-Scoring Devices, Skinners Teaching Machines and Programming Concepts, Contributions from Military and other Sources, and recent work. The appendices abstract research reports and other papers concerned with teaching machines and self-instructional concepts or programs.

92. Maccoby, Nathan, et al. *Sound Film Recordings in Improving Classroom Communications*. Stanford, California: Institute For Communication Research, Stanford University, N. D. (NDEA Title VII Project #680).

The purpose of this project was to investigate the extent to which sound film recordings of pupils in teacher-learning situations could be used as a basis for training teachers to improve their accuracy in interpretating non-verbal communications from students.

93. Maguire, James P. "Student Intercommunication System," Educational Communications Convocation Proceedings. Albany: Proceedings of the New York State Convocation on Educational Communications, Division of Educational Communications, New York State Education Department, November 22-25, 1964.

A description of Advanced Educational Systems, Inc., new AID system. The basic equipment consists of a teacher's console, a remote control unit, student response units for each student, and a low voltage power supply. A brief description of its operation is also contained.

94. Malpass, Leslie F., et al. Comparison of Two Automated Teaching Procedures For Retarded Children. Tampa: University of South Florida, 1963. (Cooperative Research Project No. 1267).

The purpose of this study was to evaluate the usefulness of linear programming methods and automated typewriter keyboard method for helping mentally retarded children to acquire and retain word recognition, reading, and spelling.

95. Margulies, Stuart and Eigen, Lewis D., Eds. Applied Programed Instruction. New York, New York: John Wiley and Sons, Inc., 1962, 387 pp.

A collection of articles which focus for the most part on the practical rather than the theoretical aspects of programmed instruction. Descriptions of program users, sources of programs, feasibility of internal production, difficulties of utilization, and economic factors form the central topics of discussion, but the applicability of devices, or even computer-based teaching systems, is also covered in some detail.

96. Martin, Ann M. and Stone, C. Walter. A Study of Regional Instructional Media Resources: Phase I - Manpower. Pittsburgh, Pa.: Center For Library and Educational Media Studies, Graduate School of Library and Information Sciences, University of Pittsburgh, 1965, (NDEA Title VII Project No. B-392).

The purpose of this study was to determine how to provide reliable information on the design of jobs and the education and training of personnel for instructional media services and programs.

97. Martin, John H. Freeport Public Schools Experiment on Early Reading Using the Edison Responsive Environment Instrument. New York: The Responsive Environments Corporation, 1965 (A Pamphlet).

Describes the use of the Edison Responsive Environment Instrument for reading instruction, by the Freeport Public School System. The Edison Responsive Environment Instrument is a computerized typewriter that reproduces several of the sensory responses of a human being. It talks, listens, accepts, responds, presents pictorial or graphic material, comments or explains, presents information, and responds to being touched. Twenty kindergarten children, five years old, were taught to read on the Edison Responsive Environment Machines over a period of 5 months at the Atkinson School in Freeport, Long Island, New York.

98. McVey, Gerald F. "Multimedia Instructional Laboratory," Audiovisual Instruction, Vol. 11, No. 2,: 80-86, February, 1966.

Describes the functioning of the (MIL), Multimedia Instructional Laboratory at the University of Wisconsin.

The primary activities of the laboratory include: a) "producing automated lecture presentations for use in regularly scheduled university classes, and b) conducting research projects related to variations in material and lecture productions, variations in the learning situation, effects of unique or cross-media utilization, analysis of student attitudes toward multiscreen presentations, variations in learning acquisition and retention, and concept identification."

99. Melching, William H., et al. Evaluation of an Auto-Instructional Program on the First Week of a Basic Electronics Course. Research Memorandum. Fort Bliss, Texas: U. S. Army Air Defense, Human Research Unit, March, 1964.

Describes the procedure and results of a study, the purpose of which was to evaluate the effectiveness of an auto-instructional program in basic electronics.

Two separate evaluations of the program were undertaken. In the first study, specific daily assignments were given, and students unable to complete the assignment were required to complete the program in the evening. In the second study, each student was instructed to proceed at his own rate, with no evening study required. It was generally concluded that self-pacing yielded higher performance than limited self-pacing, although procedural differences could have contaminated the results.

100. Michigan Department of Public Instruction. Planning the Instructional Materials Center. Department of Public Instruction. Bulletin No. 422, Lansing, Michigan: The Department.

Considers four major types of activity that must be provided for a functioning instructional materials center: (1) reading, listening to recorded materials, and viewing of projected pictures and films by students and faculty members; (2) acquiring, organizing, and housing materials for ready accessibility; (3) service and repair of materials and equipment; and (4) teacher and pupil production of locally made teaching aids.

101. Miller, Robert H. An Exploratory Study To Develop a Method of Using Electronic Data-Processing For Rapid Identification of Operational Barriers to Utilization of Selected Audiovisual Materials. Bloomington: Audio-Visual Center, Indiana University, 1964.

The purpose of this project was to develop a method of using data processing techniques for rapid identification of barriers to optimum utilization of audiovisual materials.

102. Miller, Thomas E., et al. "Impact On The University - An Educational Media Service System," Audio-Visual Instruction, Vol. 10, No. 2,: 111-114, February, 1965.

Points out that ideally educational media must be thought of as environment, and not as a static "center" somewhere. "System," is the only appropriate name for this environment. In this article the author suggests one useful classification for an educational media service system. He divides his classification into Technical Services, including Materials Production Services, Resource Services and Distribution Services, and Professional Services.

103. Mills, Donald F. and Kopstein, Felix F. Evaluation of an In-Service Television Training Program in Mathematics For Elementary Teachers. Princeton, New Jersey: Educational Testing Service, April, 1965 (NDEA Title VII Project No. B-399).

The purpose of this project was to evaluate a series of telecasts intended to instruct elementary school teachers in some of the newer mathematical concepts for use in revision of final telecast scripts.

104. Muller, Robert E. "An Integrated Library: A Multi-Media Approach to Learning," Audiovisual Instruction, Vol. 10, No. 4, : 311-312, April, 1965.

Describes Project Discovery sponsored by Encyclopedia Britannica Films and Bell and Howell, in cooperation with four school districts across the country. Project Discovery is designed to test the effect of maximum availability of instructional materials on curriculum, on pupil attitudes, achievement, creativity and motivation, and on teaching methods and techniques.

105. Neff, Monroe C. "Materials Systems For Basic Adult Education," Audiovisual Instruction, Vol. 11, No. 4, April, 1966, pp. 246-248.

This article contains a definition of materials systems, a method of evaluating materials systems, a description of a field test in North Carolina, and the pros and cons of learning systems.

106. Neidt, Charles O. Changes in Attitude During Learning: The Relationship of New Educational Media to Non-Intellective Factors in Learning - Phase II. Fort Collins: Colorado State University, December, 1964 (NDEA Title VII Project No. C-1139).

This study measured the longitudinal changes in attitudes toward formal learning experiences involving various instructional media.

107. Nennerfelt, Carl B. Flexibility Through Standardization. (A Paper) Presented at a Programmed Learning Systems Symposium, Columbus, Ohio, May 18, 1965.

The author, manager of the Switching Systems Design Division of the North Electric Company, discusses some new developments in the program distribution systems used in educational settings.

108. NSPI Newsletter. Published Monthly by the National Society For Programmed Instruction. Box 222, Trinity University, 715 Stadium Drive, San Antonio 12, Texas.

Reports on the articles of the society and its chapters. Also carries articles and papers of general interest to programers.

109. Ofiesh, Gabriel D. and Meierhenry, Wesley C., Eds. Trends in Programmed Instruction. Washington, D. C.: Department of Audio-Visual Instruction, NEA, 1964, p. 289.

A collection of 82 papers dealing with the role of the teacher, experimentation, and the programming process and its application to industry, government, defense, and health.

110. Oklahoma Christian College Datagram (produced by the North Electric Datagram Dial Access Programmed Learning System).

For the first time, a computer processor is being utilized to allow random selection of a large number of programs by all students at the college.

The new learning center at OCC provides each, and every one of the colleges 720 students with a private, permanently-assigned study center - complete with book locker, desk, typing table and electronic student learning position. By donning a headset and dialing three digits, each of the 720 students can hear any of 136 taped instructional programs keyed to the daily curriculum.

111. Orr, David B. and Friedman, H. L. Research on Speeded Speech as an Educational Medium. Washington, D. C.: American Institute for Research, June, 1964 (NDEA Title VII Project No. 1056).

To demonstrate the trainability of comprehension of speeded speech by using a paced reading method. The study sought to define and explore in a preliminary fashion research problems related to speeded speech.

112. OSU Datagram (produced by North Electric Company).

Ohio State University students can gain access to their lessons by dialing three digits from any of 269 student positions in 9 different locations on campus. They can select from any one of sixty audio programs ranging from daily oral exercises in elementary Chinese ... to Chaucer ... to Chopin.

113. Peters, George A. and Hall, Frank S. Sources of Information in Human Factors Engineering. California: Rocketdyne, Canoga Park, July, 1964.

A compilation of various publications related to all aspects of human factors engineering.

114. Powers, Joseph M. Teaching Machines: An ASTIA Bibliography. Arlington, Va.: Hg. Armed Services Technical Information Agency, February, 1962, 55 pp. Mimeo. (Armed Services Technical Information Agency Publication No. AD-271150).

A bibliography which abstracts the ASTIA projects concerned with self-instruction, and lists the books, dissertations, patents, periodicals, and Office of Education Research grants relating to programmed instruction and self-instructional devices.

115. Reichard, Joseph R. *Experimentation in the Development of More Effective Methods of Teaching Foreign Languages by Making Use of Electro-Mechanical Aids*. Oberlin, Ohio: Oberlin College, 1962 (NDEA Title VI Project No. 69).

The purpose of the Oberlin study was to determine if it is possible to double the number of students taught by one instructor in an Elementary German course, without impairing the quality of student achievement, by making extensive use of the magnetic tape recording laboratory and other electro-mechanical equipment.

116. Richland, Malcolm. *Traveling Seminar and Conference for the Implementation of Educational Innovations*. TM-2691. Santa Monica, California: System Development Cooperation. October, 1965 (NDEA Title VII Project No. B-357).

The purpose of this project was to test the effectiveness of the field extension service concept as a method for disseminating information concerning educational innovations.

117. Rigney, J. W. and Fry, E. B. "Current Teaching - Machine Programs and Programming Techniques," *AV Communication Review,* Supplement #3, Vol. 9, No. 3,: 1-22, May-June, 1961.

Reports programming techniques and samples 81 programs to illustrate the variety in subject matter and styles of programming available.

118. Rocklyn, Eugene H. and Moren, Richard I. "A Feasibility Study of a Special Machine-Taught Oral-Aural Russian Language Course. Alexandria, Va.: Human Resources Research Office, George Washington University. Reported in: Margulies, Stuart, and Eigen, Lewis O. *Applied Programed Instruction*. New York: John Wiley and Sons, Inc., 1962.

The authors demonstrated that the speaking and understanding of a foreign language (Russian) can be effectively taught without benefit of a human instructor.

119. Roy, Howard L., et al. *New Methods of Language Development For Deaf Children*. Washington, D. C.: Gallaudet College, 1964 (Cooperative Research Project No. 1383).

The purpose of this study was to investigate methods for increasing the development of language skills in the deaf child, using the typewriter as the instrument for instruction with the linear teaching program as the method. The study concluded that young deaf children can learn to use the typewriter in a short period of time and that such use can contribute to language understanding.

120. Saltzman, Irving J., et al. "Observations on the Use of Three Self-Instructional Programed Foreign Language Courses," *AV Communications Review*, Vol. 13, No. 1, 53-59, Spring 1965.

Discusses the results of a study of self-instructional, programmed foreign language courses conducted by the University of Washington, under its informal courses section of the Division of Continuing Education.

The Division of Continuing Education made available to members of the university community and to residents of the Seattle area its modern language-laboratory facility so that they could take beginning, noncredit courses in German and Spanish by means of self-instructional, programmed courses. Both programs were commercially prepared by Encyclopedia Britannica Press (TEMAC).

121. Schramm, Wilbur and Oberholtzer, Kenneth E. *The Context of Instructional Television: Summary Report of Research Findings, 1960-64*. Denver, Colorado and Stanford, California: Denver Public Schools and Stanford University, June, 1964.

The purpose of this project was to determine what combinations of related activities with TV make for most efficient learning; what kind of teaching and learning content will make for maximum learning from instructional TV; and how to build TV into a total learning situation.

122. Schramm, Wilbur. *Mass Media and National Development*. Stanford, California; Paris: Stanford University Press, 1964.

Considers the contribution that information and mass communications may make to the laborious process required for the social and economic transformation of primitive economics into modern nations.

123. Schure, Alexander. "The Impact of Programmed Self-Instruction on Scheduling and Other Logistical Administrative Problems," *I.E.E.E. Transactions on Education*, Vol. E-6, No. 2,: 7 pp., December, 1963.

This study reports on the results of the application of a systems analysis to the problem of exploiting auto-instructional methodologies as they affect scheduling and other logistical administrative problems.

124. Sheldon, James A. and Dockum, George E. "Adult Learning Through Audiovisual Aids," *Audiovisual Instruction*, Vol. 11, No. 4, April, 1966, pp. 263-265.

Describes how the Des Moines, Iowa, Public Schools have made extensive use of both films for discussion, and television in adult education programs.

125. Shriver, Edgar L., et al. *Forecast: Systems Analysis and Training Methods for Electronics Maintenance Training*. Research Report 13. Alexandria, Virginia: Human Resources Research Office; George Washington University, May, 1964.

The purpose of this study was to determine the effectiveness of employing mock-ups in developing electronic trouble-shooting techniques, as a substitute for real equipment.

The mock-ups proved effective, the mock-up group obtaining higher proficiency in trouble-shooting.

126. Silberman, Harry F. "Self-Teaching Devices and Programmed Material," *Review of Educational Research*, *XXXII*, No. 2,: 179-193, April, 1962.

Reviews the literature on programmed instruction. Materials discussed include general discussion papers, programming experiments, and studies comparing conventional and programmed instruction.

127. Sjogren, Douglas D. *Programmed Materials in High School Correspondence Courses*. Lincoln: University of Nebraska, N. D. (Cooperative Research Project No. 1534).

The purpose of this study was to determine whether materials constructed according to linear programming principles contributed significantly to more efficient and effective learning in a correspondence study setting.

128. Smith, Wendell I. and Moore, J. William, Eds. *Programmed Learning: Theory and Research*. Princeton, N. J.: D. Van Norstrand Co., Inc., 1962, 240 pp.

This work is divided into three parts which are concerned with: a) the development and an overview of the field of programmed learning with some of the relevant psychological theory are presented in Part I; b) the method - programming - is presented in Part II and c) samples of research based on the methods of programming are presented in Part III.

129. Stewart, Donald K. "The Articulated Instructional Media Program at the University of Wisconsin," *Audiovisual Instruction*, Vol. 10, May, 1965, pp. 380-382.

The article describes the Articulated Instructional Media (AIM) Program at the University of Wisconsin. The AIM Program is a four-year experimental program designed to explore ways of extending higher education to more people through new patterns of teaching and learning. It will be experimenting with the articulation of a number of media and methods: independent study; regional seminars, institutes, and workshops; radio and telephone lectures; TV instruction (both regular ETV and "slow scan" TV); programmed instruction and programmed learning devices, winter short courses; off-campus classes; traveling libraries; field laboratories; etc. Through its experimentation, AIM will encourage the creation of more meaningful patterns of learning and curricula by finding ways of removing restrictions derived from the reliance on a single approach to learning - the conventional classroom method.

130. Stolurow, Lawrence M. "Programed Instruction For the Mentally Retarded," *Review of Educational Research*, 33: 126-36, February, 1963.

The purpose of this study was to review the different kinds of research being done in the use of programmed learning for educable mentally retarded children.

131. Stolurow, Lawrence M. *Teaching By Machine*. Washington, D. C.: U. S. Government Printing Office, 1962, 173 pp. (Office of Education Pub. #OE 34010, Cooperate Research Monograph #6).

A comprehensive description of the development, status, and potential of teaching machines. Topics include: (1) Current instructional problems; (2) A systems approach to instruction; (3) Teaching machines; (4) The learner; (5) Program and Programming process; (6) Concepts and techniques; (7) Research findings; (8) Implications for education.

132. Stone, Loren. "Community Antenna Television: Its Role in ETV," *The NAEB Journal*, Vol. 23, No. 2,: 46-50, March-April, 1964.

Describes how CATV Systems - which receive television signals by master antennas and distribute them via coaxial cable to homes and schools - are playing an increasingly important role in making ETV available to schools within local communities all over the country. The author points out that "today, more than 100 CATV Systems provide cable facilities to 292 elementary schools, 85 junior high schools, 41 senior high schools, and 17 colleges and universities located in 170 communities."

133. Teal, G. E., Ed. *Programmed Instruction in Industry and Education*. Stanford, California: Public Service Research, Inc., 1963.

A verbatim report of a conference on programmed instruction held at Stanford in 1961 and organized by the Public Service Research, Inc. It was attended by people almost entirely from industrial organizations who were concerned with training. The five-day course reported in this book consisted of talks on learning theory, principles involved in program writing, cost and possible uses of programs in industrial training, and finally, sessions on program writing.

134. Teplov, Paulovich. *Essays on Cybernetics*. Washington, D. C.: Joint Publications Research Service, March, 1964.

Among the topics discussed are: (A) Cybernetics; (B) Automated machines; (C) Feedback, and (D) Information Accumulation.

135. *The Use of Programed Instruction in U. S. Schools: Report of a Survey of The Use of Programed Instructional Materials In The Public Schools of The United States During The Year 1961-62*. Washington, D. C.: The Center for Programed Instruction, Inc. and the U. S. Department of Health, Education, and Welfare, Office of Education, 1963. (NDEA Title VII, No. OE-16-008).

This volume contains the results of the second half of the two part survey dealing with (A) available programmed instructional materials, and (B) the use of these materials in schools. Both parts have been carried out by the Center for Programed Instruction, Inc.

136. Torrance, E. Paul and Gupta, R. K. *Development and Evaluation of Recorded Programmed Experiences in Creative Thinking in the Fourth Grade*. Minneapolis: Bureau of Educational Research, University of Minnesota, February, 1964 (NDEA Title VII Project No. 880).

The purpose of this experiment was to determine whether the normally observed slump in the creative thinking of fourth grade children can be counteracted through planned experiences in terms of specially prepared audio tapes.

137. Travers, Robert, M. W., Ed. Research and Theory Related to Audiovisual Information Transmission. Salt Lake City: Bureau of Educational Research, University of Utah, 1964 (NDEA Title VII Project No. C-977; University Microfilms Pub. #64-13947).

The purpose of this project was to bring together available knowledge about psychological principles involving the transmission through the visual and auditory channels which may be of value in the design of audiovisual teaching materials.

138. Twyford, Loran C. Jr., et al. New Media for Improvement of Science Instruction. Albany: Bureau of Classroom Communications, The State Education Department, the University of the State of New York. April, 1964 (NDEA Title VII Project No. 283).

The purpose of this study was to determine the extent to which the learning of ninth grade science students increased through lessons improved by various audiovisual techniques.

139. University of The State of New York, The State Education Department. Educational Communications, 1963-4. Albany: The Department, 1964.

Summarizes 43 selected research papers and demonstrations presented at a New York State Convocation held in late 1963. It covers the latest developments in such diverse audiovisual fields as appraisal of media and materials, educational television, electronic classrooms, instructional films, and programmed instruction and teaching machines.

140. Van Phelan, Louis. "A Class Full of Courses: An Unusual Experiment in Programed Teaching," Audiovisual Instruction, Vol. II, No. 4, April, 1966, pp. 251-253.

Describes an experimental system, instituted at the University Adult High School, Los Angeles, California, a system of programmed instruction which was influenced by U. S. Air Force and industrial programmed instruction in which successful and practicable learning is essential and cost, thoroughness, and time are important factors.

The article contains a description of the methods used in selecting students, instructors, and materials; a description of the initial class and a review of the outcomes.

141. Vlcek, Charles. "Classroom Simulation in Teacher Education," Audiovisual Instruction, Vol. 11, No. 2,: 87-90, February, 1966.

Describes a project, completed in September 1965 at Michigan State University, East Lansing. The purposes of the project were (a) "to determine the effectiveness of a classroom simulator in providing teacher-trainees with experience in identifying and solving classroom problems prior to their actual student teaching; (b) to determine if the knowledge learned as a result of the classroom simulator experience would be transferable to student teaching practice; and (c) to determine if through classroom simulator experience a teacher-trainee's self-confidence in his ability to teach could be elevated."

142. Weisgerber, Robert A. and Rasmussen, Warren. "A Teaching System for Musical Listening," Audiovisual Instruction, Vol. 11, No. 2,: 106-109, February, 1966.

Describes a project conducted with 4th grade students at the Frederic Burk School at San Francisco State College in which the students were taught the basic skills for musical listening. To implement the project, the Edex Teaching System was used in the preparation and presentation of tapes which contained all desired verbal and musical material on one track. Signals were placed on a 2nd track for automatically activating such auxiliary devices as overhead, slide, and motion picture projectors at any desired point in the sequence of instruction.

143. Wilds, Preston Lea and Zachert, Virginia. "Teaching Machines and Programed Instruction: The Use in Medical Education of Constructed Response Branching Answer Programs," AV Communications Review, Vol. 13, No. 1,: 59-68, Spring 1965.

The authors describe an approach to programmed instruction for student education at the Medical College of Georgia. The approach, for clinical teaching, has been a dual one. The first, which was initiated in 1963 consists of development of content-oriented, linear programs which present a subject from a standpoint similar to that of a conventional series of lectures. The second approach, which is currently being developed, consists of the development of patient-oriented branching programs to provide the students with experience in patient management, and clinical problem solving.

144. Williams, Don G. and Snyder, Luella V. *Motion Picture Production Facilities of Selected Colleges and Universities.* Office of Education, U. S. Department of Health, Education, and Welfare. Bulletin 1963, No. 15, OE-51005. Washington, D. C.: Government Printing Office, 1963 (NDEA Title VII Project No. B-066).

This report is an account of a survey conducted by the University Film Foundation during the Spring and Fall of 1960 in order to arrive at an overall picture of the competencies and production potential of university film units by investigating their staff resources, equipment, physical facilities, services, administrative support, and record of performance.

145. Witherspoon, John P. "The Educational Communications System: A Whole Problem Look At Transmission Requirements of Education," *Audiovisual Instruction*, Vol. 11, No. 1,: 10-13, January, 1966.

Describes the work of the Educational Communications System, a project of the National Association of Educational Broadcasters under a contract with the U. S. Office of Education. The project is concerned about such problems as, "What do computers and TV cameras have in common? and, What has radio to do with facsimile reproduction of graphic material?"

146. Wittich, Walter A. and Schuller, Charles F. *Audiovisual Materials*: Their Nature and Use. 3rd Ed. New York: Harper & Brothers, 1962.

Describes the nature and use of audiovisual materials in addition to sections on the teacher and communications, and how people learn.

147. Woodward, John C. *The Effect of Immediate Feedback on Learning in Social Science.* Report 8, Office for the Study of Instruction. Coral Gables, Fla.: University of Miami, September, 1964.

Reports on a project undertaken to determine whether or not learning could be increased during a TV lecture by using a student feedback system to teach a social science course. The experiment did not support the hypothesis that concepts presented in a feedback system will be learned significantly better than concepts not so presented.

148. Woodward, John C. The Effect of Immediate Feedback on Learning in Humanities. Report 7, Office For the Study of Instruction. Coral Gables, Florida: University of Miami, June, 1964.

Report on a project undertaken to determine the effects upon learning of providing immediate feedback to instructors of the amount of learning taking place during a TV lecture. A General Electric feedback system was used.

149. Wylie, Donald G. "Twenty Years of Airborn TV," The NAEB Journal, Vol. 23, No. 6,: 70-76, November-December, 1964.

A review of the development of airborn TV, covering the past twenty-years, and focusing on the role of the Federal Communications Commission in the development of airborn telecasting.

LIST OF PUBLICATIONS CURSORILY REVIEWED

Books

1. Bloom, G. S. and Krathwohl, D. R. Taxonomy of Educational Objectives, New York, 1956, Longmans, Green & Co.

2. Coulson, John E. Programmed Learning and Computer--Based Instruction, New York: John Wiley and Sons, 1962.

3. Cramm, David. Explaining Teaching Machines and Programming, San Francisco, Fearon Publishers, 1961.

4. Deterline, William. An Introduction to Programmed Learning, New York: Harcourt, Brace, 1962.

5. Epstein, Sam and Beryl. The First Book of Teaching Machines, New York, 1961.

6. Foltz, Charles L. The World of Teaching Machines, Washington, D. C., 1961.

7. Galanter, Eugene (Editor). Automatic Teaching, The State of the Art, New York, John Wiley & Sons, 1959.

8. Green, Edward J. The Learning Process and Programmed Instruction, New York: Holt, Rinehard and Winston, 1962.

9. Hilgard, Ernest R. Theories of Learning, (2nd Edition), New York: Appleton-Century-Crofts, 1956.

10. Holland, James and Skinner, B. F. The Analysis of Behavior, New York: McGraw-Hill, 1961.

11. Keller, Fred S. Learning Reinforcement Theory, New York: Random House, 1954.

12. Lumsdaine, A. A. and Glaser, Robert (Editors). Teaching Machines and Programmed Learning: A Source Book, Washington, D. C. : NEA Department of Audio-Visual Instruction, 1960.

13. Lysaught, Jerome P. (Editor). Programmed Learning: Evolving Principles and Industrial Applications, Ann Arbor: Foundation for Research on Human Behavior, 1961.

14. Mager, Robert F. Preparing Objectives for Programmed Instruction, San Franciso: Fearon Publishers, 1961.

15. Margulies, Stuart and Eigen, Lewis (Editors). Applied Programmed Instruction, New York: John Wiley & Sons, 1962.

16. Newer Educational Media. Papers of the Regional Research Conference, The Pennsylvania State University, University Park, 1961.

17. *New Teaching Aids for the American Classroom--A Symposium*, Stanford University, Stanford, California, The Institute for Communication Research, 1960.

18. *Programs, '62: A Guide to Programmed Instructional Materials*, Washington, D. C.: U. S. Office of Education, 1962.

19. Stolurow, Lawrence M. *Teaching by Machine*, Cooperative Research Monograph Number 6, Washington, D. C.: U. S. Department of Health, Education and Welfare, 1961.

Periodicals

AID - Auto-instructional devices, Published monthly by INRAD, Educational & Training Methods Division, P. O. Box 4456, Lubbock, Texas.

Automated Teaching Bulletin, Published four times a year by Rheem Califone Corporation, 1020 North LaBrea Avenue, Los Angeles 38, California.

CPI Newsletter, Center for Programmed Instruction, 365 West End Avenue, New York 24, New York.

Articles

1. AACTE. "Working Papers of the National Conference on Teaching Education and New Media," January 8-11, 1961.

2. AASA Staff. "Tools for Teaching," December, 1959, *National Educational Association Journal*, National Education Association, Washington, D. C., P. 51.

3. Adams, Edmund B. "The Shakedown of a Teaching Machine," *Automated Teaching Bulletin*, Spring, 1961, 1:26-27.

4. Adams, Sam. "A Fable of the 80's" *NEA Journal*, 1961, 50, 8, 24.

5. Adkins, D. C. "Measurement in Relation to the Educational Process," *Educational and Psychological Measurement*, Summer, 1958, 18:221-40.

6. Alexander, Howard, and Gilpin John. "A Ready Method for Self-Instruction Program Presentation," 1960, Earlham College, Richmond, Indiana.

7. Alexander, Howard, and Smith, R. F. "A Self-Instructional Program in Elementary Statistics," Mimeo, 1961, Earlham College.

8. Allen, Layman E. "WFF 'N Proof: The Game of Modern Logic," Programmed Text materials incorporated into 24 games to teach mathematical logic, 24 game kit, $5., ALL (Accelerated Learning of Logic) Project, Yale Law School, New Haven, Connecticut.

9. Allen, Layman E.; Brooks, Robin, B. S.; Dickoff, James W.; and James, Patricia, A. "The ALL Project (Accelerated Learning of Logic)", *American Mathematical Monthly*, 1961, 68, No. 5, 497-500.

10. Allen, L. E., and James, Patricia A. "Toward A Systematic Procedure for Developing Skinner Learning Programs," March, 1960, Yale Law School, New Haven, Connecticut.

11. Allen, W. H., "Research on Film Use: Student Participation," *Audio-Visual Communication Review*, Spring, 1957, 5:423-50.

12. Allison, Fay S., "A Comparison of Methods for Teaching Certain Counseling Materials," Master's thesis, 1960, University of Utah.

13. Alter, Millicent; Eigen, Lewis D.; and King, Shirley. "The Effect of Confirmation plus Trinket Reinforcers on Young Children," Center for Programmed Instruction, New York, Monograph No. 112.

14. Ammons, R. B. "Knowledge of Performance: Survey of Literature. Some Possible Applications and Suggested Experimentation," Wright-Patterson Air Force Base, Ohio: Wright Air Development Center, 1954, WADC Technical Report 54-14.

15. Amsel, A. "Error Responses and Reinforcement Schedules in Self-Instructional Devices," 1960, p.506-16.

16. Amsel, A. "Some Comments on the Manipulation of Error Responses and Reinforcement Schedules in Self-Instructional Training Devices," Unpublished Staff Memorandum, Maintenance Laboratory, AFPTRC, Lowry Air Force Base, Colorado, September, 1957.

17. Anderson, S. B. "Analysis of Responses in a Task Drawn from Calculus of Propositions," *NRL Memorandum Report*, 1956, 608.

18. Andreas, Burton. "Research Findings Related to Automated Teaching," Unpublished Paper. Presented before the Genesee Valley School Study Council, Rochester, New York, University of Rochester, 1960.

19. Angell, D.; and Lumsdaine, A.A. "Prompted Plus Unprompted Trials Versus Prompted Trials Alone in Paired-Associate Learning," 1960 (in press), Pittsburgh American Institute for Research.

20. Angell, G. W. "The Effect of Immediate Knowledge of Quiz Results on Final Examination Scores in Freshman Chemistry," *Journal of Educational Research*, January, 1949, 42:391-94.

21. Angell, G. W.; and Troyer, M. E. "A New Self-Scoring Test Device for Improving Instruction," School and Society, January 31, 1948, 67:84-85

22. Armed Services Technical Information Agency (ASTIA), Document Center. "Title Announcement Bulletin," Dayton, Ohio: The Center (Knott Bldg.).

23. ASTRA ZENITH Corp. "Auto-Score," New York, the Corporation, 515 Madison Avenue.

24. Auble, D., and Mech, E. V. "Quantitative Studies of Verbal Reinforcement in Classroom Situations: I. Differential Reinforcement Related to the Frequency of Error and Correct Responses," *Journal of Psychology*, April, 1953, 35:307-12.

25. Audio-Visual Instruction of NEA, April 1961, Issue Theme: "Self-Instructional Devices."

26. "Automation Devices in College Teaching," *School & Society*, November 19, 1960.

27. "Automation in the Classroom," *Financial World*, December 21, 1960.

28. Azrin, N. H. "Some Effects of Two Intermittent Schedules of Immediate and Non-Immediate Punishment," *Journal of Psychology*, 1956, 42:3-21.

29. Babcock, Chester D. "The Teacher, TV, and Teaching Machines," *National Education Journal*, May 1960, 49:30-1.

30. Baker, K. E.; Wylie, R. C.; and Cagne, R. M. "Transfer of Training to a Motor Skill as a Function of Variation in Rate of Response," *Journal of Experimental Psychology*, 1950. p. 721-732.

31. Baldwin, H. "Electronic Visual Audio Training Aid," Fort Huachua, Arizona: U. S. Army Electronic Proving Ground, Contract DA-36-039-SC-80146.

32. Baldwin, H. A. "A Self-programming Teaching Machine," Read at the Southeastern Universities Computer Conference, University of Arizona, March, 1960.

33. Bamford, H. E., Jr. "The Use of Training Aids in Conceptual Training," Pittsburgh, Pa., July 1955, American Institute for Research.

34. Banghart, Frank W. "An Experiment with Teaching Machines and Programmed Textbooks," University of Virginia, Mimeo., Undated.

35. Bard, Bernard. "The Teaching Machine," New York Post, Sunday, January 1, 1961.

36. Barlow, John A. "Aspects of Programming: Learning and Performance," Unpublished Paper, Presented at the American Psychological Association Meeting in Chicago, 1960.

37. Barlow, John A. "Aspects of Teaching Machine Programming: Learning and Performance," Psychological Review, 1961, 11:43-46.

38. Barlow, John A. "Auto-Instructional Procedures for Teaching Facts, Skills and Values in a General Psychology Course," Read at the American Psychological Association Meeting, New York, 1961.

39. Barlow, John A. "Conversational Chaining in Teaching Machine Programs," Psychological Reports, 1960, 8:207-209.

40. Barlow, John A. "The Earlham College Self-Instructional Program," AV Communications Review, 1960, 8:207-209.

41. Barlow, John A. "The Impact of 'Teaching Machines' on Educational Philosophy; From 'Sponge and Sieve' to Self-Serve Spoon Feeding," (Based on a paper read at the Ohio Psychological Association, November, 1960, Earlham College, Richmond, Indiana.

42. Barlow, John A. "A New Form of Pressy Multiple-Choice Board," Psychological Reports, 1960, 6:214.

43. Barlow, John A. "New Instruction Media: Self Instruction, Guided Instruction, and the Role of the Teacher," Project Description: HEW Project No. 7-12-026.00, 1959.

44. Barlow, John A. "Project Tutor," Psychological Reports, 1960, 6:16-20.

45. Barlow, John A. A review of "Automatic Teaching: The State of the Art," (Edited by E. H. Galanter), Harvard Educational Review, 1960 (in press.)

46. Barlow, John A. "The Teacher and the Teaching Machine," AID, 1961, 1:5-6.

47. Barlow, John A. "Teaching Machines and Educational Philosophy," School and Society, April 22, 1961, 201-02.

48. Barlow, John A. "Trends in the Use of Learning Machines," In Current Issues in Higher Education, 1960, National Education Association, Washington, D. C.

49. Beck, J. "On Some Methods of Programming," "Automatic Teaching: The State of the Art," (Edited by E. H. Galanter) New York, John Wiley & Sons, 1959, Chap. 3, p. 55-62.

50. Beck, Jacob and Shaw, W. A. "Learning and Teaching: An Analysis and Characterization," Memorandum EP-9, University of Pennsylvania, University Park, October, 1960.

51. Bendick, Marc. "Automated Instruction: Hardware and Logic," Unpublished Paper. Presented at the Society of Motion Picture and Television Engineers Meeting, Hollywood, California, November, 1960.

52. Benson, Eugene and Kopstein, Felix. "Machine Teaching of Basic Electronics at Keesler Air Force Base: An Experiment and Results," Paper delivered at the DAVI Convention, Miami, April 24, 1961.

53. Besnard, G. G.; Briggs, L. J.; Mursch, G.A.; and Walker, E. S. "Development of the Subject-Matter Trainer," Technical Memorandum, Armament Systems Personnel Research Laboratory, AFPTRC, Lowry Air Force Base, Colorado, March, 1955. (ASPRL-TM-55-11).

54. Besnard, G. G.; Briggs, L. J., and Walker, E. S. "The Improved Subject Matter Trainer," Technical Memorandum, Armament Systems Personnel Research Laboratory, AFPTRC, Lowry Air Force Base, Colorado, April, 1955. (ASPRL-TM-55-11).

55. Bilsky, M. "Implication of Programmed English Teaching for Mentally Retarded Children," Unpublished thesis presented at Allerton Park Conference on Automation in Special Education, 1960.

56. Blank, Stanley S. "Teaching Machine: What have Studies in Classroom Shown?" *California Journal of Educational Research*, May, 1961, p. 99.

57. Blyth, John S. "An Educational Experiment," College Hill, 1960, 4, No. 2, 4 p.

58. Blythe, John W. "Teaching Machines and Human Beings," *The Educational Record*, April, 1960.

59. Blyth, John W. "Teaching Machines and Logic," *American Math. Mon.*, 1960, 67, 285-287.

60. Boehm, George A. W. "Can People Be Taught Like Pigeons?" *Fortune*, October, 1960.

61. Borg, Walter R., and Cragun, John R. "The Teaching Machine as a Study Aid," Read at the American Psychological Association Meeting, New York, 1961.

62. Boroff, David. "The Three R's and Pushbuttons," The New York Times Magazine, September 25, 1960.

63. Boutwell, W. D. "What's Happening in Education?" National Parent Teacher, June, 1960.

64. Braine, Martin D. S. "On Learning the Grammatical Order of Words in Sentences of Artificial and Natural Languages," Read at the American Psychological Association Meeting, New York, 1961.

65. Braley, Ian. "Will Robots Teach Your Child," Today's Living, September 4, 1960.

66. Briggs, L. J. "Applied Research Problems," Paper read at Symposium on Automated Teaching, Western Psychological Association Convention, San Diego, California, April, 1959.

67. Briggs, L. J. "Design of Maintenance Training Equipment for Fighter-Interceptor Fire Control Systems," Technical Memorandum, Maintenance Laboratory, AFPTRC, Lowry Air Force Base, Colorado, August 1957, (ML-TM-57-16).

68. Briggs, L. J. "Problems in Simulation and Programming in the Design of Complex-Skill Trainers," Paper read at Symposium on Research Issues in the Study of Human Learning Raised by Developments in Automated Teaching Methods, American Psychological Association Convention, Cincinnati, September, 1959, (p. 329-35.).

69. Briggs, L. J. "A Survey of Cueing Methods in Education and in Automated Programs," Pittsburgh: American Institute for Research Report AIR-314-60-IR-106, May, 1960. (AFOSR-TN-60-286).

70. Briggs, L. J. "Teaching Machines," USAF-NRC Symposium on Education and Training Media, (Edited by G. Finch), Washington, D. C., National Academy of Sciences - National Research Council, 1960, (in press).

71. Briggs, L. J. "Teaching Machines, Education, and Job Skills," Psychological Reports, 1959, 5:210.

72. Briggs, L. J. "Teaching Machines and the Training of Space Crews," American Institute for Research, Santa Barbara, California, April, 1960.

73. Briggs, L. J. "Teaching Machines for Training of Military Personnel in Maintenance of Electronic Equipment," "Automatic Teaching: The State of the Art," (Edited by E. H. Galanter), New York, John Wiley & Sons, 1959, Chapter 12, p. 131-46.

74. Briggs, L. J. "A Troubleshooting Trainer for the E-r Fire Control System," Technical Memorandum, Maintenance Laboratory, AFPTRC, Lowry Air Force Base, Colorado, May, 1956. (ML-TM-56-16).

75. Briggs, L. J. "A Troubleshooting Trainer for the E-r Fire Control System," Lackland Air Force Base, Texas: Air Force Personnel and Training Research Center, July, 1956, Development Report, AFPTRC-TN-56-94. ASTIA Document No. 098870.

76. Briggs, L. J. "Two Self-Instructional Devices," *Psychological Reports*, December, 1958, 4:671-76 (p. 299-304).

77. Briggs, L. J. and Besnard, G. G. "The Benefits from Increased Practice in Training Electronic System Mechanics," Technical Memorandum, Armament Systems Personnel Research Laboratory. AFPTRC, October, 1955.

78. Briggs, L. J. and Besnard, G. G. "Experimental Procedures for Increasing Reinforced Practice in Training Air Force Mechanics for an Electronic System," *Symposium on Air Force Human Engineering, Personnel, and Training Research*. Edited by G. Finch and F. Cameron, Washington, D. C.: National Academy of Sciences - National Research Council, Publication 455, 1956, Library of Congress Card Catalog No. 56-60063, p. 48-58.

79. Briggs, L. J. and DuVall, W. E. "Design of Two Fire Control System Maintenance Training Devices," Lackland Air Force Base, Texas: Air Force Personnel and Training Research Center, September, 1957, Technical Report AFPTRC-TR-57-7, (ASTIA Document No. 134242).

80. Briggs, L. J. Plashinski, D.; and Jones, D. L. "Self-Pacing Versus Automatic Pacing of Practice on the Subject-Matter Trainer," Unpublished Laboratory Note, AFPTRC, ASPRL-LN-55-8, Lowry Air Force Base, Colorado, September, 1955. (Mimeo.).

81. Brown, G. I. and Hodgkinson, H. L. "A Note Concerning 'An Application of Recent Developments in Psychology to the Teaching of German' " by C. B. Ferster and S. M. Sapon, Harvard Educational Review, 2, 156-57, 1958.

82. Bryan, G. L.; Bond, N. A., Jr.; LaPorte, H. R., Jr.; and Summers, S. "The AUTOMASTS: An Automatically-Recording Test of Electronic Troubleshooting," Technical Report No. 11, Prepared for the Personnel and Training Branch. Psychological Sciences Division, Office of Naval Research, at the Department of Psychology, University of Southern California, Los Angeles, August, 1957. (Mimeo.).

83. Bryan, G. L. and Rigney, J. W. "Current Trends in Automated Tutoring and Their Implications for Naval Technical Training," Department of Psychology, University of Southern California, Technical Report No. 29, December, 1959.

84. Bryan, G. L.; Rigney, J. W.; and Van Horn, C. "An Evaluation of the Types of Information for Supplementing Knowledge of Results in Training Technique," Technical Report No. 19, prepared for the Personnel and Training Branch, Psychological Sciences Division. Office of Naval Research, at the Department of Psychology, University of Southern California, Los Angeles, April, 1957.

85. Bryan, G. L. and Rigney, J. W. "An Evaluation of a Method for Shipboard Training in Operations Knowledge," Technical Report No. 18, prepared for the Personnel and Training Branch, Psychological Sciences Division, Office of Naval Research, at the Department of Psychology, University of Southern California, Los Angeles, September, 1956.

86. Bryan, G. L., and Schuster, D. H. "The Effectiveness of Guidance and Explanations in Trouble Shooting Training," Technical Report No. 28, Electronics Personnel Research Group, University of Southern California, 1959.

87. Bryan, G. L., and Schuster, D. H. "An Experimental Comparison______ Troubleshooting Training Techniques, Technical Report No. 30, prepared for the Personnel and Training Branch, Psychological Sciences Division, Office of Naval Research, at the Department of Psychology, University of Southern California, Los Angeles, December, 1959.

88. Buchwald, A. M. "Extinction After Acquisition Under Different Ver?_____ Reinforcement Combinations," *Journal of Experimental Psychology*, January, 1959, 57:43-48.

89. Buitenkand, N. "Methods of Instruction in Component Location for Troubleshooting in Complicated Equipment and Means for Testing Accuracy of Answers," U. A. Patent No. 2,764,821. Filed August 25, 1953 (assigned to Van Valkenburgh, Nooger, and Nelville, Inc., New York), patented October 2, 1956.

90. Bushnell, Don D. and Cogswell, John G. "Computer-based Laboratory for Automation in School Systems," System Development Corporation, Santa Monica, California, Report No. Sp-256, March, 1961.

91. Bylinsky, Gene. "Robot Teachers," *The Wall Street Journal*, August 8, 1960.

92. Calvin, Allen D. "A Demonstration Class Using Teaching Machines for Ninth-Grade Algebra," 1960, Hollins College, Virginia.

93. Calvin, Allen D. "Preliminary Report on the Roanoke Programmed Textbook Project," 1961, Britannica Center for Studies in Learning and Motivation, Hollins College, Virginia.

94. Calvin, Allen. "A Report on Retention of Programmed Material," Hollins College, Virginia.

95. Campbell, E. "Utilizing the Teaching Machine for Cerebral Palsy Children," Unpublished study presented at Allerton Park Conference on Automation in Special Education, 1960.

96. Campbell, Vincent N. "Adjusting Self-Instruction Programs to Individual Differences: Studies of Cueing, Responding Bypassing," 1961, American Institute for Research, San Mateo, California, Interim Report. (AIR-C41-8/61-SR).

97. Cantor, J. H. and Brown, J. S. "An Evaluation of the Trainer-Tester and Punchboard Tutor as Electronics Trouble-shooting Training Aids," (George-Peabody College), Port Washington, N. Y.; Special Devices Center, Office of Naval Research, October 1956, Technical Report NTDC-1257-2-1.

98. Carpenter, C. R. "Application of Programming Principles to Instructional Television: A Progress Report," Read at the American Psychological Association Meeting, New York, 1961.

99. Carpenter, D. R. and other. "The Classroom Communicator," (The Pennsylvania State University), Port Washington, New York: Special Devices Center, Office of Naval Research, October 1950, Technical Report SDC 269-7-14.

100. Carpenter, F. "How Will Automated Teaching Affect Education?" *The University of Michigan School of Education Bulletin*, October, 1959.

101. Carpenter, Finlay. "Reinforcement and Instruction," Read at the American Psychological Association Meeting, New York, 1961.

102. Carpenter, F. "The Teaching Machine and Its Education Significance," Paper read at the Twelfth Annual Meeting of the American Association of Colleges for Teacher Education, Chicago, Illinois, February, 1960.

103. Carr, W. J. "Bibliography on Teaching Machines," Unpublished report, Lewisburg, Pennsylvania, Bucknell University, 1958.

104. Carr, W. J. "Self-Instructional Devices: A Review of Current Concepts," Wright-Patterson Air Force Base, Ohio, Aero-Space Medical Laboratory, Wright Air Development Center, August, 1959. WADC Technical Report 59-503. (Article appears in this volume under title "A Functional Analysis of Self-Instructional Devices," p. 540-62).

105. Cass, James. "New Tools for Teaching," *Saturday Review*, February 18, 1961, pp. 60-61, 75.

106. Casmir, F. L. "Human Teacher is Still Best," *California Teacher Association Journal*, September, 1960, 56:41-4.

107. Cassidy, Viola M. "The Effectiveness of Self-Teaching Devices in Facilitating Learning," Unpublished Ph.D. dissertation, Columbus, Ohio; 1950, No. 58, p. 73-79, Ohio State University *Abstracts of Ph.D. Theses*, 1948, 1949.

108. "Center for Programmed Instruction," *Audiovisual Instruction*, April, 1961.

109. Chapman, Robert L. "Design Challenges in Employing Programmed Learning," Los Angeles, Thompson-Ramo-Wooldridge, 1961 (offset).

110. Chalmers, E. L. Jr.; Morrison, E. J.; Briggs, I. J. and Pens, E. H. "Evaluation of a Method for Teaching Trouble-shooting Techniques," Technical Memorandum, Maintenance Laboratory, AFPTRC Lowry Air Force Base, Colorado, December, 1957. (ML-TM-57-34).

111. Chapman, R. L. and Kennedy, J. L. "The Background and Implications of the Systems Research Laboratory Studies," *Symposium on Air Force Human Engineering*, Personnel and Training Research, (Edited by G. Finch and F. Cameron), Washington, D. C., 1956, National Academy of Sciences - National Research Council, Publication 455.

112. Charry, Larry (Editor) "Teaching Machine Program Register," Philadelphia, 1961, Temple University, (Mimeo.).

113. Chavez, Simon. "Why Not Rig Your Classroom Quiz?" *Audio-Visual Instruction*, 1961, 6, 139-139.

114. "Choosing a Program," *Programmed Instruction*, October, 1961, Bulletin 2, 4, 6, Center for Programmed Instruction, 365 West End Avenue at 77th Street, New York 24, N. Y.

115. Cogswell, John F. and Bushnell, Don D. "A System Approach to Education," Read at the American Psychological Association Meeting, New York, 1961.

116. Coleman, William A. "Instant Learning," *The American Weekly*, August 28, 1960, p. 10-11.

117. "The Coming Boom in Teaching Machines," *Control Engineering*, June, 1960.

118. Conner, Forrest E. "What Should an Administrator's Attitude Be?" *National Education Association Journal*, 1961, 50, 8, 26-27.

119. Conoley, Colleen; King, F. J.; and Reid, Jacson B. "An Evaluation of Two Principles Involved in Programmed Learning Devices: University of Texas, Austin.

120. Cook, Desmond L. "Teaching Machine Terms: A Glossary," *Audiovisual Instruction*, April, 1961.

121. Cook, Donald A. "Programmed Learning: A Revolution in Instruction," *Graduate Faculties Newsletter*, November, 1960, Columbia University.

122. Cook, Donald A. "On Vanishing Stimuli in Instructional Material," *Automated Teaching Bulletin*, 1960, 1, No. 3, 32.

123. Cook, Fred S. "Some Advantages and Limitations of Self-Instructional Devices," *Balance Sheet*, December, 1960, 42:154-156.

124. Cook, J. O. "Research in Audio-Visual Communication," *Research Principles and Practices in Visual Communication*, (Edited by J. Ball and F. C. Byrnes) East Lansing, Michigan, National Project in Agriculturea Communications, Michigan State University, 1960, p. 91-106.

125. Cook, J. O. and Kendler, T. S. "A Theoretical Model to Explain Some Paired-Associate Learning Date," *Symposium on Air Force Human Engineering, Personnel, and Training Research* (Edited by G. Finch and F. Cameron), Washington, D. C., National Academy of Sciences - National Research Council, Publication 455, 1956, (Library of Congress Card Catalog No. 56-60063), p. 90-98.

126. Cook, J. O. and Spitzer, M. E. "Supplementary Report: The Effects of Between-Term Delay and Overt Practice of the Response Term Upon Paired-Associate Learning," Unpublished paper, 1959.

127. Cook, J. O. and Spitzer, M. E. "Supplementary Report: Prompting Versus Confirmation in Paired-Associate Learning: *Journal of Experimental Psychology*, 1960, 59:275-76.

128. Cook, T. W. "Factors in Massed and Distributed Practice," *Journal of Experimental Psychology*, 1944, p. 325-334.

129. Cornell, F. G; Damrin, D. E.; Saupe, J. L. and Crowder, N. A. "Proficiency of Q-24 Radar Mechanics III, The Tab Test - A Group Test of Troubleshooting Proficiency," Lackland Air Force Base, Texas, Air Force Personnel and Training Research Center, November, 1954, Research Bulletin, AFPTRC-TR-54-52.

130. Corrigan, Robert E. "Automated Teaching Methods: A Review of Fundamentals, Concepts and Developments," Automated Teaching Bulletin, 1959, 1, No. 2, 23-30.

131. Corrigan, Robert E. "Automated Teaching Methods: A Solution To Our Educational Problems," Rheem Manufacturing Company, 400 Park Avenue, New York, New York.

132. Corrigan, Robert E. "A Dilemma: How to Provide Quality Education for the Individual Student Within an Ever-expanding Mass Educational System," 1961, Corrigan and Associates, Inc., Garden Grove, California.

133. Corrigan, Robert E. "Individualizing Television Instruction," Unpublished paper, presented before the San Francisco State College Institute, "Training by Automation in Industry," November, 1960.

134. Corrigan, Robert E. "A Solution to Some Pressing Problems in Education," California Teachers Association Journal, September, 1960.

135. Corrigan, Robert E. "Teaching Machines and Automated Instructional Methods," Journal of The American Society of Training Directors, April, 1960.

136. Coulson, John E. "Automated Instruction: Theory and Design," Unpublished paper, presented at the Society of Motion Picture and Television Engineers Meeting, Hollywood California, November, 1960.

137. Coulson, John E. "An Experimental Teaching Machine for Research at SDC," Technical Memorandum, System Development Corporation, Santa Monica, California, October, 1959.

138. Coulson, John E. "Programming for Individual Differences," paper read at Symposium on Automated Teaching, Western Psychological Association Convention, San Diego, California, April, 1959.

139. Coulson, John E. and Silberman, Harry F. "Effects of Three Variables in a Teaching Machine," Journal of Educational Psychology, 51, 1960, (in press).

140. Coulson, John E. and Silberman, Harry F. "Proposal for Extension of Automated Teaching Projects," Unpublished Field Note, System Development Corporation, Santa Monica, California, July, 1959.

141. Coulson, John E. and Silberman, Harry F. "Results of Initial Experiment in Automated Teaching," System Development Corporation, Santa Monica, California, July, 1959, p. 452-68.

142. Cragun, J. R. "The Use of the Teaching Machine as a Study Aid at the College Level and Some Related Implications," Master's thesis, Utah State University, 1960.

143. Cross, K. P. and Gaier, E. L. "Technique in Problem-Solving as a Predictor of Educational Achievement," *Journal of Educational Psychology* 46, April, 1955, 194-206.

144. Crowder, Norman A. "The Arithmetic of Computers," Published by Western Design, a Division of U. S. Industries, Inc., Santa Barbara Airport, Goleta, California, 1960.

145. Crowder, Norman A. "Automatic Tutoring," *Feedback*, 1961, 1, No. 4, 7.

146. Crowder, Norman A. "Automatic Tutoring by Intrinsic Programming," 1960, p. 286-98.

147. Crowder, Norman A. "Automatic Tutoring by Means of Intrinsic Programming," Proceedings of the Educational Testing Service Invitational Conference, October, 1959, on "The Impact of Testing on the Educational Process," Princeton, New Jersey, Educational Testing Service, 1960, (in press).

148. Crowder, Norman A. "Automatic Tutoring by Means of Intrinsic Programming," *Automatic Teaching: The State of the Art*, (Edited by E. H. Galanter) New York, John Wiley & Sons, 1959, Chap. 10, p. 109-16.

149. Crowder, Norman A. "An Automatic Tutoring Book on Number Systems," Volume I, Timonium, Md., Hoover Electronics Co., 1958.

150. Crowder, Norman A. "An Automatic Tutoring Book on Number Systems," Vols. I, II, and III, Arlington, Virginia, Psychological Research Associates, 1958, PRA Report No. 58-17.

151. Crowder, Norman A. "The Auto-Tutor Concept," Unpublished paper, presented before the San Francisco State College Institute, "Training by Automation in Industry," November, 1960.

152. Crowder, Norman A. "The Concept of Automatic Tutoring," Unpublished Staff Memorandum, Armament Systems Personnel Research Laboratory, AFPTRC, Lowry Air Force Base, Colorado, October, 1955.

153. Crowder, Norman A. "Intrinsic Programming," Unpublished study presented at Allerton Park Conference on Automation in Special Education, 1960.

154. Crowder, Norman A. "Intrinsically Programmed Materials for Teaching Complex Skills and Concepts," Paper read at Symposium on Automation of Teaching, American Psychological Association Convention, Washington, D. C., August, 1958.

155. Crowder, Norman A. "A Part-Task Trainer for Troubleshooting," Lackland Air Force Base, Texas. Air Force Personnel Training and Research Center, June, 1957, Development Report AFPTRC-TN-57-71 (ASTIA Document No. 131423).

156. Crowder, Norman A. "Self-Instructional Materials for GETS Trainer," Experimental Manual, Unpublished document, Maintenance Laboratory, AFPTRC, Lowry Air Force Base, Colorado, October, 1956.

157. Crowder, Norman A. "Teaching Machines Are a Threat to Teacher," School Management, May, 1960.

158. Crowder, Norman A. "The 'Tutor'," Journal of the American Society Training Directors, May, 1960.

159. Crowder, Norman A. and Zachert, Virginia. "Use of the Auto-Tutor at Keesler AFB to Train in Fundamentals of Electronics," Memorandum Report No. 1, Training Systems, Western Design and Electronics.

160. Current Research-Review of Lumsdaine & Glaser: "Teaching Machines and Programmed Learning; A Source Book," School Libraries, March, 1961.

161. Curriculum Study Committee. Second Progress Report. Department of Engineering, University of California, Los Angeles, May, 1958.

162. Curtis, F. D. and Woods, G. G. "A Study of the Relative Teaching Values of Four Common Practices in Correcting Examination Papers," School Review, October, 1929, 37:615-23.

163. Dale, Edgar. "Self-Instruction Through Programmed Materials," The News Letter (Bureau of Educational Research and Service), Ohio State University, 1961, 26, No. 5, 1-4.

164. Dallenbach, K. M. "The Effect of Practice Upon Visual Apprehension in School Children," Journal of Educational Psychology, 1914, 5:321-44, 369-404.

165. Damrin, D. E. and Saupe, J. L. "Proficiency of Q-24 Radar Mechanics: IV. An Analysis of Checking Responses in Troubleshooting on Tab Test Problems," Lackland Air Force Base, Texas: Air Force Personnel and Training Research Center, November, 1954, Research Bulletin AFPTRC-TR-54-53.

166. Darby, D. L. "An Annotated Bibliography on the Automation of Instruction," Research Memorandum, U. S. Army Air Defense Human Research Unit, Fort Bliss, Texas, July, 1959, (Mimeo.).

167. David, E. E., Jr. "Voice-Actuated Machines: Problems and Possibilities," *Bell Laboratories Record*, August, 1957, 35:281-86.

168. Davis, Nancy H. "A Second Teacher," *Audiovisual Instruction*, 1961, 6, 134-135.

169. Davis Scientific Instruments. "Projector Programmer," *Davis Scientific Bulletin*, 1959, p. 151.

170. Day, J. H. "Teaching Machines," *Journal Chemical Education*, 1959, 36:591-595.

171. Day, J. H. "Teaching Machines," Unpublished paper, (Athens: The Ohio University, 1959).

172. Decker, Bert J. "Teaching Machines and Creative Behavior," (Based on slide briefing presented to Seventh Creative Problem-Solving Institute, June, 1961) University of Buffalo, New York.

173. de Kieffer, R. E. "Teaching Machines, Self-Instruction Devices," *Colorado School Journal*, May, 1961.

174. Delattre, Pierre. "Testing Students' Progress in the Language Laboratory," *Automated Teaching Bulletin*, Summer, 1960, Vol. 1, No. 3.

175. Deterline, William A. "Response Mode: Different Effect or Different Purpose?" *Aid*, September, 1961.

176. Deutsch, William R. "Pre-Organized and Self-Organized Automata," Unpublished paper presented at the San Francisco State College Institute, "Training by Automation in Industry," November, 1960.

177. Diederich, P. B. "Self-Correcting Homework in English," *Proceedings of the Educational Testing Service Invitational Conference*, October, 1959, on "The Impact of Testing on the Educational Process," Princeton, New Jersey, Educational Testing Service, 1960 (in press).

178. "Directory of Automated Teaching," Automated Teaching Bulletin, Spring, 1961, 1:28-46.

179. Dowell, E. C. "An Evaluation of Trainer-Testers," Headquarters, Technical Training Air Force, Keesler Air Force Base, Mississippi, June, 1955, (Report No. 54-28).

180. Dyna-Slide Company. "The Dyna-Slide Program Scanner," Dyna-Slide Company Bulletin, 1960.

181. Eaton, Donald K. "Teaching Machines," Curriculum Bulletin, Vol. 17, School of Education, University of Oregon, March, 1961.

182. Eckstrand, Gordon A.; Rockway, Marty R.; Kopstein, Felix F.; and Morgan, Ross L. "Teaching Machines in the Modern Military Organization," Wright Air Development Division, December, 1960.

183. "Education," Business Week, September 17, 1960.

184. "Education," Time, March 24, 1961.

185. Edwards, W. D. "Skinner's Teaching Machines," Unpublished Laboratory Note, Maintenance Laboratory, AFPTRC, Lowry Air Force Base, Colorado, May, 1956, (Mimeo.).

186. Edwards, W. D. "The Use of Statistical Decision Functions in Making Practical Decisions," Symposium on Air Force Human Engineering, Personnel, and Training Research. (Edited by G. Finch and F. Cameron), Washington, D. C., National Academy of Sciences - National Research Council Publication 455, 1956, (Library of Congress Card Catalog No. 56-60063), p. 115-24.

187. Eigen, L. D. "The Construction of Frames of an Automated Teaching Program," Collegiate School Automated Teaching Project, November, 1959, New York, New York.

188. Eigen, Lewis D. "The Construction of Frames of an Automated Teaching Program," Collegiate School, 1960, New York (revised).

189. Eigen, Lewis D. "Some Problems in Field Testing Programs for Teaching Machines," Journal of Educational Sociology, Vol. 34, Number 8.

190. Eigen, Lewis D. "Technology and Educational Practice," Center for Programmed Instruction, New York, Monograph No. 108.

191. Eigen, Lewis D. and Komoski, P. K. "Research Summary No. 1 of the Collegiate School Automatic Teaching Project," Report to the Foundation for the Advancement of Education, June, 1960, (Mimeo.).

192. Eigen, Lewis D. and Komoski, P. K. "Teaching Machines Can Aid the Schools to Make Better Use of Teacher Time," California Journal of Secondary Education, April 1960.

193. Elam, Stanley (Editor). "Keeping Abreast in Education," Phi Delta Kappa, February, 1961, SLII:22.

194. Electronic Teaching Machines - Blessing or Curse," Popular Electronics, November, 1960, p. 60-3, 130-2.

195. "Encyclopedia House Enriches Its Pitch," Business Week, January 21, 1961.

196. Epps, H. O., McCammon, G. B. and Simmons, Q. D. "Teaching Devices for Children with Impaired Learning," Columbus, Ohio, Parents Volunteer Association, 1958, p. 81.

197. Ericksen, S. C. "Variability of Attack in Massed and Distributed Practice," Journal of Experimental Psychology, 1942, p. 339-345.

198. Esbensen, Thorwald. "Multiple Choice, Constructed Response: Different in Effect?" Aid, June-July, 1961.

199. Eurick, Alvin C. "New Strategy for America's Schools," Saturday Review, September 3, 1960, 43:27-39.

200. Evans, J. L. "Conversion to Number Bases Other Than Ten," Unpublished programmed text, Pittsburgh, Pennsylvania, University of Pittsburgh, Department of Psychology, August, 1958.

201. Evans, J. L. "An Investigation of 'Teaching Machine', Variables Using Learning Programs in Symbolic Logic," Doctor's thesis, University of Pittsburgh, 1960, (Typewritten), (Also in Press Mimeo.), to be issued as a report under a grant to the University of Pittsburgh from the Cooperative Research Program of the United States Office of Education.

202. Evans, J. L.; Glaser, R. and Homme, L. E. "The Development and Use of a 'Standard' program of Investigating Programmed Verbal Learning," read at the American Psychological Association, Chicago, September, 1960.

203. Evans, J. L.; Glaser, R. and Homme, L. E. "A Preliminary Investigation of Variation in the Properties of Verbal Learning Sequences of the 'Teaching Machine' Type, Paper read at the annual convention of the Eastern Psychological Association, Atlantic City, New Jersey, April, 1959, p. 446-51.

204. Evans, J. L.; Glaser, R.; and Homme, L. E. "The RULEG System for the Construction of Programmed Verbal Learning Sequences," 1960, University of Pittsburgh, Pittsburgh, Pennsylvania, Project No. 691 (9417).

205. Evans, J. L.; Glaser, R.; Homme, L. E.; and Stelter, C. "Descriptive Statistics: A Programmed Textbook," (Vol. I of a Program in Statistics), Albuquerque, New Mexico, Teaching Machines, Inc., 1960.

206. Everett, J. Bernard, "Programmed Learning in Public Schools," to be published in the report of the symposium on Tomorrow's Teaching, Frontiers of Science Foundation of Oklahoma, Inc., 1961.

207. Exton, Elaine. "Teaching Machines: Fad or Here to Stay?" *American School Board Journal*, September, 1960, 141:18-22.

208. Falconer, G. A. "A Machine for Teaching Word Recognition to Young Deaf Children," Unpublished study presented at Allerton Park Conference on Automation in Special Education, 1960.

209. Falconer, G. A. "A Mechanical Device for Teaching Word Recognition to Young Deaf Children," Ed.D. thesis, University of Illinois, 1959.

210. Falconer, G. A. "Teaching Machines for the Deaf," *Volta*, Reprint No. 730, 1960.

211. Fattu, N. A. "A Catalogue of Troubleshooting Tests," Research Report No. 1, prepared for the Personnel and Training Branch, Psychological Sciences Division, Office of Naval Research, by the Institute of Educational Research, Indiana University, Bloomington, December, 1956.

212. Fattu, N. A. "Potential Contribution of Technology to Education," read at the American Psychological Association Meeting, 1961.

213. Fattu, N. A. "Training Devices," *Encyclopedia of Educational Research*, Third Edition, 1960, New York, The Macmillan Company.

214. Feldhusen, John F. "Problems Schools Will Face in Planning to Use Teaching Machines," Education of Administration and Supervision (in press).

215. Feldhusen, John F. "Will Teaching Machines Produce Machine Teaching?" *Wisconsin Journal of Education*, 1961, 93, 18-20.

216. Feldman, S. M. and Underwood, B. J. "Stimulus Recall Following Paired-Associate Learning," Journal of Experimental Psychology, 1957, p. 11-15.

217. Ferrer, Terry. "Can Machines Really Teach?" New York Herald Tribune, December 18, 1960.

218. Ferster, C. B. "The Role of Review Material in Continuous Programming with Teaching Machines," proposal submitted to Commissioner of Education, United States Office of Education, Department of Health, Education and Welfare, June, 1959.

219. Ferster, C. B. and Sapon, S. M. "An Application of Recent Developments in Psychology to the Teaching of German," Harvard Educational Review, Winter, 1958, 28:58-69, p. 173-85.

220. Ferster, Marilyn. "Arithmetic for Nurses: Programmed for Class Use and Home Study," 1961, Springer Publishing Co., Inc., 44 East 23rd Street, New York 10, New York.

221. Finn, J. D. "Automation and Education: I. General Aspects," Audio-Visual Communication Review, Winter, 1957, 5:343-60.

222. Finn, J. D. "Automation and Education: II. Automatizing the Classroom - Background of the Effort," Audio-Visual Communication Review, Spring, 1957, 5:451-67.

223. Finn, J. D. "Automation and Education: III. Technology and the Instructional Process," Audio-Visual Communication Review, Winter, 1960, 8:5-26.

224. Finn, J. D. "Educational Technology - A New Force," ALA Bulletin, February, 1961.

225. Finn, J. D. "From Slate to Automation," Audio-Visual Instruction, March, 1959, 4:84-85, 100-101.

226. Finn, J. D. "A Look at the Future of Audio-Visual Communication," Audio-Visual Communication Review, Fall, 1955, 3:244-56.

227. Finn, J. D. "The Principal Faces the New Technology," The National Elementary Principal, January, 1961.

228. Finn, J. D. "Teacher Understanding - Keys to the New Technology," California Teachers Association Journal, September, 1960.

229. Finn, J. D. "Teaching Machines: Auto-Instructional Devices for the Teacher," NEA Journal, November, 1960.

230. Finn, J. D. "Technology and the Instructional Process," Phi Delta Kappan, June, 1960, XLI:9:371-378.

231. Finn, J. D. and Richardson, Elinor. "Principal Faces the New Technology," *National Elementary Principal*, January, 1961, 40:18-22.

232. Finstad, Alice. "First Reports on Roanoke Math Materials," *Audio-Visual Instruction*, 1961, 6:150-151.

233. Flory, John and Hope, Thomas W. "Non-Theatrical Films -- Interim Report No. 2," *Journal of the SMPTE*, January, 1961, Volume 70.

234. Folley, John D. (Editor). "Human Factors Methods for System Design," Report AIR-290-60-255. The American Institute for Research, Pittsburgh, 1960.

235. "For Brighter Students? Teaching Machines," *Newsweek*, August 17, 1959.

236. Foringer and Co., Inc. "Information Bulletin 7," September, 1959; 7A, October, 1959.

237. Frazier, A. "Opinions Differ: Technology in Education," *National Education Association*, September, 1960.

238. Freeman, J. T. "The Effects of Reinforced Practice on Conventional Multiple Choice Tests," *Automated Teaching Bulletin*, September, 1959, 1:19-20.

239. Fritz, J. D. "Educational Technology: A Way to Its Assessment," *Administrator's Notebook*, February, 1961, Vol. IX, No. 5.

240. Fry, Edward. "California Steps Out With Teaching Machines," *California Teachers Association Journal*, September, 1960.

241. Fry, Edward. "A Classification of Variables Involved in a Programmed Learning Situation," 1961, Loyola University, Los Angeles, California.

242. Fry, Edward. "The Mechanical Teacher," *The Texas Outlook*, June, 1960, p. 10-11.

243. Fry, Edward. "Programming Trends," *Audio-Visual Instruction*, April, 1961.

244. Fry, Edward. "A Study of Teaching Machine Response Modes," 1960, p. 469-74.

245. Fry, Edward. "Teaching Machine Dichotomy: Skinner Versus Pressey." Paper read at the annual convention of the American Psychological Association, Cincinnati, September, 1959. (In press, *Psychological Reports*).

246. Fry, Edward. "Teaching Machines: The Coming Automation," *The Phi Delta Kappan*, October, 1959, 41: 28-31.

247. Fry, Edward. "Teaching Machines: An Investigation of Constructed Versus Multiple-Choice Response Modes." Doctor's thesis. Los Angeles, University of Southern California, 1960.

248. Fry, Edward. "Teaching Machines: An Investigation of Constructed Versus Multiple-Choice Methods of Response," *Automated Teaching Bulletin*, December, 1959, 1: 11-12.

249. Frye, Northrop. "Push-button Gadgets May Help - But the Teacher Seems Here to Stay," *Varsity Graduate*, Christmas 1960, VIII, p. 45.

250. Fund for the Advancement of Education. "They Went to College Early," New York: The Fund, 655 Madison Avenue, New York 21, New York.

251. Fusco, Gene C. "Programmed Self-Instruction: Possibilities and Limitations," *The High School Journal*, 1960, 44, 85-90.

252. Fusco, Gene C. "The Teacher and the Teaching Machine," *The Tennessee Teacher*, December, 1960.

253. Fusco, Gene C. "Technology in the Classroom: Challenges to the School Administrator," *School Life* 42: 18-23, May, 1960.

254. Gagne, R. M. "AFPTRC Maintenance Laboratory Research and Development Program." Unpublished Staff Memorandum, Maintenance Laboratory, AFPTRC, Lowry Air Force Base, Colorado, December, 1957.

255. Gagne, R. M. "The Effect of Sequence of Presentation of Similar Items on the Learning of Paired Associates," *Journal of Experimental Psychology* 40: 61-73, February, 1950.

256. Gagne, R. M. "Teaching Machines and Transfer of Training." Paper read at Symposium on Research Issues in the Study of Human Learning Raised by Developments in Automated Teaching Methods, *American Psychological Association Convention*, Cincinnati, September, 1959.

257. Gagne, R. M. "Training Devices and Simulators: Some Research Issues," *American Psychologist* 9: 95-107, March, 1954.

258. Gagne, R. M. and Baker, K. E. "On the Relation Between Similarity and Transfer of Training in the Learning of Discriminative Motor Tasks," *Psychologist Review*, pp. 670-79, 1950.

259. Gagne, R. M. and Bolles, R. C. "A Review of Factors in Learning Efficiency," *Automatic Teaching: The State of the Art* (Edited by E. H. Galanter.) New York: John Wiley and Sons, 1959, Chap. 2, p. 13054. (This paper was earlier given limited distribution as a separate report prepared for the Air Force Office of Scientific Research, November, 1958: AFOSR-TN-58-924, ASTIA Document No. AD 162275).

260. Gagne, Robert M. and Foster, H. "Transfer to a Motor Skill from Practice on a Picture Representation," Journal of Experimental Psychology, pp. 342-355.

261. Galanter, Eugene. "Common Statistics Uncommonly Taught." (A Review of "Descriptive Statistics" by J. L. Evans, L. E. Homme, R. Glaser, and C. J. Statler; published by Teaching Machines, Inc., 1960), Contemporary Psychology, 1961, 6, 104-106.

262. Galanter, E. H. "The Ideal Teacher." Automatic Teaching: The State of the Art. (Edited by E. H. Galanter.), New York: John Wiley & Sons, 1959, Chap. 1, p. 1-12 (b).

263. Galanter, Eugene. "The Mechanization of Learning." NEA Journal, 1961, 50, 8, 16-19.

264. Galanter, Eugene. "Mechanization of Teaching." Bulletin of the National Association of Secondary-School Principals, 44: 301-9; April, 1960.

265. Galanter, Eugene. "Theory of Programmed Learning and Teaching Machines." To be published in the report of the symposium on Tomorrow's Teaching, Frontiers of Science Foundation of Oklahoma, Inc., 1961.

266. Galanter, Eugene. "Two Models of a Student." Teachers College Record, 1960, 62, 187-194.

267. Gavurin, Edward I. and Donahue, Miss Virginia M. "Logical Sequence and Random Sequence." Automated Teaching Bulletin, 1961, 1, No. 4, 3-9.

268. General Dynamics Corporation, Electric Boat Division, (Groton, Conn.), "The All Electronic 'Autoscore' - ". Unpublished memorandum. U.

269. Gibson, E. J. "Retroactive Inhibition as a Function of Degree of Generalization Between Tasks," Journal of Experimental Psychology, pp. 93-115, 1941.

270. Gibson, E. J. "A Systematic Application of the Concepts of Generalization and Differentiation to Verbal Learning." Psychologist Review, pp. 196-229, 1940.

271. Gilbert, A. C. F. "Effect of Immediacy of Knowledge of Correctness of Response Upon Learning." Journal of Educational Psychology, 47: 415-22; November, 1956.

272. Gilbert, T. F. "An Early Approximation of Principles of Analyzing and Revising Self-Instructional Programs." Paper read at the Air Force Office of Scientific Research and University of Pennsylvania Conference on the Automated Teaching of Verbal and Symbolic Skills, Philadelphia, December, 1958, U. (a).

273. Gilbert, T. F. "An Early Approximation to Principles of Programming Continuous Discourse, Self-Instructional Materials." *Psychological Problems and Research Methods in Mathematics Training.* (Edited by R. L. Feierabend and P. H. DuBois). Washington University, Cooperative Research Project No. 642, USOE, June, 1959 (Mimeo.) (a).

274. Gilbert, T. F. "An Early Approximation to Principles of Programming Continuous Discourse, Self-Instructional Materials." A Report to Bell Telephone Laboratories, September, 1958, (Unpublished paper, mimeo.) U.(b).

275. Gilbert, T. F. "On the Relevance of Laboratory Investigation of Learning to Self-Instructional Programming." Symposium paper presented at the Annual Convention of the American Psychological Association, Cincinnati, September, 1959, pp. 475-85, (b).

276. Gilbert, Thomas F. "Lessons That Teach." Read at the APA meeting, New York, 1961.

277. Gilbert, T. F. "Some Issues Involved in Selecting an Automatic Teaching Device." A Report to the Bell Telephone Laboratories, September, 1958 (Unpublished paper, mimeo.) U. (c).

278. Gilbert, T. F. "Some Recent Attempts at the Partial Automation of Teaching." A Report to the University of Georgia, 1958 (Unpublished paper, mimeo.) U. (d).

279. Gilmore, Ken. "Teaching Machines - Blessing or Curse?" *Popular Electronics*, November, 1960.

280. Gilpin, John B. "Design and Evaluation of Instructional Systems." Read at the APA meeting, New York, 1961.

281. Ginther, John R. "Man, Values, and the Machine." *Elementary School Journal* 60: 179-89; January, 1960.

282. Girson, Rochell. "Latest on Teaching Tools." *Saturday Review of Literature*, February 16, 1957.

283. Glaser, R. "Christmas Past, Present, and Future." *Contemporary Psychology* 5: 24-28; 1960 (p. 23-31) (a).

284. Glaser R. "Comments on the USE OF TEACHING MACHINE TECHNIQUES in the Language Laboratory." *Language Teaching Today.* (Edited by F. J. Oinas.) A Report of the Language Laboratory Conference held at Indiana University, January 22-23, 1960. Publication No. 14 of the Indiana University Research Center in Anthropology, Folklore, and Linguistics. (In press, 1960) (b).

285. Glaser, R. "Knowledge of Learning and Methods of Training." Unpublished paper. (Pittsburgh, Pa.: University of Pittsburgh, February 28, 1958) U.

286. Glaser, R. "Principles and Problems in the Preparation of Programmed Learning Sequences." Paper read at the University of Texas, May, 1960. (Also to be published as a report of a Cooperative Research Program Grant to the University of Pittsburgh under sponsorship of the U. S. Office of Education. (In press, 1960) (c).

287. Glaser, Robert. "The Science of Learning and Programmed Instruction," 1961, American Institute for Research, Pittsburgh, Pennsylvania.

288. Glaser, Robert. "Some Basic Notions in Programmed Learning," 1961, American Institute for Research, Pittsburgh, Pennsylvania.

289. Glaser, Robert. "The Teaching Machine in Industry; A New Technology." Unpublished paper. Presented before the San Francisco State College Institute, "Training by Automation in Industry," November, 1960.

290. Glaser, R., Damrin, D. E., and Gardner, F. M. "The Tab Item; A Technique for the Measurement of Proficiency in Diagnostic Problem Solving Tasks." Education and Psychological Measurement 14; 283-93, Summer 1954, pp. 275-85.

291. Glaser, Robert and Fullick, Margaret. "Programmed Learning and Classroom Instruction." Pennsylvania School Journal, May, 1961.

292. Glaser R. and Glanzer M. "Training and Training Research." Pittsburgh, Pennsylvania. American Institute for Research, August, 1958.

293. Glaser, R., Homme, L. E., and Evans, J. L. "An Evaluation of Textbooks in Terms of Learning Principles." Paper read at the meeting of the American Education Research Association, Atlantic City, New Jersey, February, 1959, pp. 437-45.

294 Glaser, R. and Phillips, J. C. "Guided Missile Personnel Research; Report No. 5, An Analysis of Tests of Proficiency for Guided Missile Personnel; II." The Troubleshooting Board. Pittsburgh, Pennsylvania. American Institute for Research, 1954.

295. Glaser, Robert and Schaefer, Halmuth H. "Programmed Teaching," The Journal of Teacher Education, March, 1961.

296. Goebel, Laurence G. "A Simple Device for Skinner Disc Programs," Audiovisual Instruction, April, 1961.

297. Goldbeck, R. A. "The Effect of Response Made and Learning Material Difficulty on Automated Instruction." Technical Report 1, *American Institute for Research*, Santa Barbara, California, September, 1960.

298. Goldbeck, K. A. and Briggs, L. J. "An Analysis of Response Made and Feedback Factors in Automated Instruction." Technical Report No. 2, *American Institute for Research*, Santa Barbara, California, November, 1960.

299. Goldbeck, R. A., Campbell, V. N., and Llewellyn, Joan E. Further experimental Evidence on Response Modes in Automated Instruction." Technical Report No. 3, *American Institute for Research*, Santa Barbara, California, December, 1960.

300. Goldstein, M. and Chalmers, E. L. Jr. "Photo-Identification Concepts via Teaching Machine." Unpublished paper, 1960, U.

301. Gorow, Frank F. "I Wrote a Scrambled Book." *Audiovisual Instruction*, April, 1961.

302. Gotkin, Lassar G. "Research at the Center for Programmed Instruction." Mimeo., 1962.

303. Gotkin, Lassar G. and Goldstein, Leo S. "Programmed Instruction for the Younger Learner: A Comparison of Two Presentation Modes in Two Environments." *Center for Programmed Instruction*, New York, Monograph No. 111.

304. Greenspoon, J. and Foreman, S. "Effect of Delay of Knowledge of Results on Learning a Motor Task." *Journal of Experimental Psychology* 51: 226-28; March, 1956.

305. Grings, W. W., Rigney, J. W., Bond, N. A., and Summers, S. A. A. *Methodological Study of Electronics Troubleshooting Skill: I. Rationale for and Description of the Multiple-Alternative Symbolic Troubleshooting Test*. Technical report prepared for the Personnel and Training Branch, Psychological sciences Division, Office of Naval Research, at the Department of Psychology, University of Southern California, Los Angeles, August, 1953.

306. Gropper, George L. Programming for Group Instruction. Read at the APA meeting, New York, 1961.

307. Gropper, George L. and Lumsdaine, Arthur A. An experimental comparison of a conventional TV lesson with a programmed TV lesson requiring active student response. Studies in Televised Instruction, 1961, *American Institute for Research*, Pittsburgh, Pa., Report No. 2.

308. Guilford, J. P., Kettner, N. W., and Christensen, P. R. *A Factor-Analytic Investigation of the Factor Called General Reasoning*. Report from the Psychol. Lab., No. 14, Los Angeles: University of Southern California, 1955.

309. Gunther, Max. "Automation in the Classroom," *American Legion Magazine*, July, 1961.

310. Gustafson, C. B. "A Simple Device for Demonstrating Addition and Substraction in the Binary Number System." *Mathematics Teacher* 47: 499-500; November, 1954.

311. Guthrie, E. R. "Conditioning: A Theory of Learning in Terms of Stimulus Response Association." The Psychology of Learning. Forty-First Yearbook Part II of the National Society for the Study of Education. Bloomimington, Ill.: The Society, 1942, Chap. 1, pp. 17-60.

312. Hall, Roy M. Automation and the Profession of Education. Read at the APA meeting, New York, 1961.

313. Harris, Chester W., et al. "Teaching Machines," *The Encyclopedia of Educational Research*, pp. 1529-33, New York: The Macmillan Company, 1960.

314. Hateh, Richard S. "More on the Respnnse Mode Controversy." *AID*. December, 1961.

315. Harrisberg, E. L. "Teaching Kinematics by Project Synthesis," *Journal of Engineering Education*, pp. 283-286, January, 1958.

316. Hasterok, G. R. *Automated Teaching of Sightful Vocabulary to Mentally Retarded Children*. Unpublished paper presented at Allerton Park Conference on Automation in Special Education, 1960.

317. Hatch, Richard. Doubleday's Tutor Texts. Read at the APA meeting, New York, 1961.

318. Hatch, R. S. "An Evaluation of the Effectiveness of a Self-Tutoring Approach Applied to Pilot Training," Wright-Patterson Air Force Base, Ohio: Wright Air Development Center, 1959. WADC Technical Report, TR 59-320.

319. Hechinger, Fred M. "Concern With Gadgetry Obscures Vital Issues of Education," *New York Times*, July 9, 1961, p. 8.

320. Henning, G. "Meeting the Teacher Shortage," Technical Military Planning Operation, General Electric Company, Santa Barbara, California, February, 1957, U.

321. Henry, William G., Jr. "What Makes a Teaching Machine Teach?" *Audiovisual Instruction*, April, 1961.

322. Here is a deluxe version of a computer-type teaching machine. Mid-Hudson Channel, 1961, 10, No. 2, 21.

323. Hilgard, E. R. "Learning Theory and Its Applications." *New Teaching Aids for the American Classroom*. Stanford University, California: *The Institute for Communication Research*, 1960, pp. 19-26 (Library of Congress Card Catalog No. 60-11138).

324. Hilgard, Ernest R. What support from the psychology of learning? *NEA Journal*, 1961, 50, 8, 20-21.

325. Hill, W. W. Tester-Rater, Self-Tutoring Punchboard Device 20-E-2-e. Port Washington, New York, Special Devices Center, Office of Naval Research, September-October, 1955, Special Devices Center Bimonthly Report, U.

326. Hirsch, R. S. *The Effects of Knowledge of Test Results on Learning of Meaningful Material*. (The Pennsylvania State University) Port Washington, New York: Special Devices Center, Office of Naval Research, September, 1952, Technical Report SDC 269-7-30.

327. Hively, W. "An Exploratory Investigation of an Apparatus for Studying and Teaching Visual Discriminarion, Using Pre-School Children," 1960, pp. 247-56.

328. Hively, W. "Implications for the Classroom of B. F. Skinner's Analysis of Behavior," *Harvard Education Review* 29: 37-42, Winter 1959.

329. Holland, J. G. *Design and Use of a Teaching Machine Program*. Read at the Am. Psychol. Assn., Chicago, September, 1960.

330. Holland, James G. *Establishing Skills through Self-Instruction*. Read at the APA meeting, New York, 1961.

331. Holland, J. G. *Practical Methods of Evaluating Teaching Machines and Programs*, 1960, Harvard University, Cambridge, Mass.

332. Holland, James G. "The Psychological Bases for Teaching Machines." Unpublished paper presented before the American Institute of Graphic Arts, New York, May, 1960.

333. Holland, J. G. "Teaching Machine: An Application of Principles from the Laboratory," 1960, pp. 215-28. Also published in Proceedings of the Educational Testing Service Invitational Conference, October, 1959, on "The Impact of Testing on the Educational Process." Princeton, N. J.: Educational Testing Service, 1960 (In press).

334. Holland, James G. *Teaching Psychology by a Teaching-Machine Program*. Harvard University, Cambridge, Mass.

335. Holland, J. G. and Porter D. 'The influence of repetition of incorrectly answered items in a teaching-machine program." Read at the Am. Psychol. Assn., Chicago, September, 1960.

336. Holland, J. G. and Skinner, B. F. "A Self-Tutoring Introduction to a Science of Behavior." Unpublished manuscript. (Cambridge, Mass.: Psychological Laboratories, Harvard University, circa 1958-59) U.

337. Holt, H. O. and Hammock, Joseph. "Books as Teaching Machines: Some Data." Reat at the Midwestern Psychological Association, May, 1961.

338. Homme, L. E. "The Rationale of Teaching by Skinner's Machines," 1957, pp. 133-136.

339. Homme, Lloyd E., Editor. "Research Notes," *Automated Teaching Bulletin*, Vol. 1, No. 1, September, 1959.

340. Homme, Lloyd E. "TMI-Grolier Programmed Texts." Read at the APA meeting, New York, 1961.

341. Homme, L. E. and Glaser, R. "Problems in Programming Verbal Learning Sequences." Paper read at Symposium on Research Issues in the Study of Human Learning Raised by Developments in Automated Teaching Methods, American Psychological Convention, Cincinnati, September, 1959, pp. 486-96 (a).

342. Homme, L. E. and Glaser, R. "Relationships Between the Programmed Textbook and Teaching Machines." *Automatic Teaching: The State of the Art*. (Edited by E. H. Glanter.) New York: John Wiley & Sons, 1959, Chap. 9, pp. 103-108 (b).

343. Horsman, Donald L. "Instruction Principles Outlined," *Bulletin to the Schools*, February, 1961, pp. 155-158.

344. Hosmer, Clark L. "Payoff in Programming of Tutoring Units." Read at the APA meeting, New York, 1961.

345. Hosmer, Col. Clark L. and Nolan, Capt. James A. Time Saved by a Tryout of Automatic Tutoring. *Automated Teaching Bulletin*, 1960, 1., No. 3, 17-18.

346. Hoban, C. F. "The Usable Residue of Educational Film Research." *New Teaching Aids for the American Classroom.* Stanford University, California: The Institute for Communication Research, 1960, pp. 95-115. (Library of Congress Card Catalog No. 60-11138.)

347. Hovland, C. I. "A Communication Analysis of Concept Learning." *Psychological Review* 59: 461-72; 1952.

348. Hovland, C. I. "A Set of Flower Designs for Experiments in Concept Formation." American Journal of Psychology 66: 140-42; 1953.

349. "How Far Are We Going With Machine Teaching," Personnel Journal, December, 1960.

350. Huffman, Harry. "Will Teaching Machines Make You Obsolete?" Business Education World 40: 11-13, 36; February, 1960.

351. Hughes, John L. "The Effectiveness of Programmed Instruction: Experimental Findings for 7070 Training." Center for Programmed Instruction. New York, Monograph No. 110.

352. Hughes, J. L. "Industrial Applications of Teaching Machines." Journal of the American Society of Training Directors, July, 1961.

353. Hughes, J. L. and McNamara, W. J. The Potential of Programmed Instruction. Personnel, 1961, 38, No. 6, 59-67.

354. Hyer, Anna L. and Snider, Robert C. "The Profession and the Machine." California Teachers Association Journal, September, 1960.

355. "Implications of the Teaching Machine for Firemanship Training." Fire Engineering, March, 1961.

356. Irion, A. L. "An Investigation of Four Modes of Operation and Three Types of Learning Tasks on the Improved Subject Matter Trainer." Unpublished paper, Maintenance Laboratory, AFPTRC, Lowry Air Force Base, Colorado, 1957.

357. Irion, A. L. and Briggs, L. J. "Learning Task and Mode of Operation Variables in Use of the Subject Matter Trainer." Lowry Air Force Base, Colorado: Air Force Personnel and Training Research Center, October, 1957. Technical Report AFPTRC-TR-57-8 (ASTIA Document No. AD 134252).

358. Israel, M. L. "Educational Redesign: A Proposal." School Review 67: 292-304; 1959.

359. Israel, M. L. "Skinnerian Psychology and Educational Redesign." Paper read at the 1958 Symposium sponsored by the American Psychological Association Committee on the Relations Between Psychology and Education, Washington, D. C., September, 1958. (See following reference.)

360. Israel, M. L. "Variably Blurred Prompting: I. Methodology and Application to the Analysis of Paired-Associate Learning." Journal of Psychology 50: 43-52; 1960.

361. Jacobson, John, Jr. "Teaching High School Students a College Level Course by Means of a Learning Machine Program." *Mid-Hudson Channel*, 1961, 10, No. 2, 14.

362. Jasner, M. M. "What the Philadelphia Schools are Doing About Automation." *AM. BSNS-Ed*. 17:37-9 plus, October, 1960.

363. Jenkins, W. J. "Listening and Machines," *El. Engl*. 37:409-10, October, 1960.

364. Jensen, Arthur R. "Teaching Machines and Individual Differences." *Automated Teaching Bulletin*, Vol. 1, No. 3, Summer 1960.

365. Jensen, Arthur E. "Reinforcement, Psychology and Individual Differences." Read at the APA meeting, New York, 1961.

366. Jensen, B. T. "An Independent-Study Laboratory Using Self-Scoring Tests." *Journal of Educational Research* 43: 143-37; October, 1949.

367. John, E. R. and Miller, J. G. "The Acquisition and Application of Information in the Problem-Solving Process: An Electronically Operated Logical Test," *Behavioral Science*, 2: 291-300, 1957.

368. Kanner, J. H. The Development and Role of Teaching Aids in the Armed Forces. In Schramm, W. (Ed.), *New Teaching Aids in the American Classroom*, Stanford: Stanford University Press, 1960.

369. Katz, M. S. and Stauffer, C. B. "The Application of Programmed Teaching Methods to Defense Products Training." General Electric Company. Teach. Information Series, R60POD14, August, 1960.

370. Keislar, Evan R. "A Comparison of Two Response Modes in an Auto-Instrüctional Program with Children in the Primary Grades." Read at the APA meeting. New York, 1960.

371. Keislar Evan R. "The Development of Understanding in Arithmetic by a Teaching Machine." *Journal of Educational Psychology* 50: 247-53; 1959, pp. 425-36 (a).

372. Keislar Evan R. "Reinforcement Procedures in Teaching Algebraic Concepts to First Graders." Read at the APA meeting, New York, 1961.

373. Keislar, Evan R. "Theoretical Aspects of Automated Teaching." Paper read at the annual convention of the Western Psychological Association, San Diego, California, April, 1959, U (b).

374. Keislar, Evan R. and McNeil, John D. *Teaching Scientific Theory to First Grade Pupils by an Auto-Instructional Device*. 1960. University of California, Los Angeles.

375. Keller, F. S. Discussion of "Automated Teaching." Read at the APA meeting, Chicago, 1960.

376. Kemp, Jerrold E. "Learning About Self-Instruction," *Audiovisual Instruction*, April, 1961.

377. Kendler, H. H. "Teaching Machines and Psychological Theory." *Automatic Teaching: The State of the Art*. (Edited by E. H. Galanter.) New York: John Wiley & Sons, 1959, Chap. 15, pp. 177-86.

378. Kennedy, Ward. "Electrifying the Three R's." *Pageant*, February, 1961.

379. Kimble, G. A. and Wulff, J. J. The Effect of "Response Guidance" on the Value of Audience Participation in Training Film Instruction. Washington, D. C.: Air Force Human Factors Operations Research Laboratories, 1953 (HFORL Report No. 34) L.

380. Kinder, J. S. *Audio-Visual Materials and Techniques*. New York: American Book Co., 1950.

381. Kinder, J. S. "Audio-Visual Research: Where to Find It." *Audio-Visual Communication Review* 1: 234-41; Fall 1953.

382. King, Paul E. "Teaching Machines and the Language Laboratory." *American School Board Journal*, 141:17-18, 35; August,

383. Klass, Philip. "Video-Sonics Cuts Production Defects," *Aviation Week*, January 4, 1960.

384. Klaus, David J. "The Art of Auto-Instructional Programming," *AV Communication Review*, March-April, 1961.

385. Klaus, David J. "Programming: A Re-emphasis on the Tutorial Approach," *Audiovisual Instruction*, April, 1961.

386. Klaus, David J. "Some Observations and Findings from Auto-Instructional Research." *American Institute for Research*, Mimeo., 1960.

387. Klaus, D. J. (In collaboration with Holmok, E. S., Lumsdaine, A. A., Meyer, D. S., and Quisenberry, K. S.) *High School Physics*. (A two-volume programmed texts: Vol. 1, *Introduction and Static Electricity*, 545 pp.; Vol. e, *Reflection and Refraction*, 720 pp.) Pittsburgh, Pa.; *American Institute For Research*, 1960, L.

388. Klaus, D. J. and Glaser, R. "Studies of Navy Guided Missile Teams." Pittsburgh, Pa.: *American Institute for Research*, December, 1958, L.

389. Klaus, D. J. and Lumsdaine, A. A. "An Experimental Field Test of the Value of Self-Tutoring Materials in High School Physics." An Interim Report of Progress and Preliminary Findings. Pittsburgh, Pa.: *American Institute for Research*, April, 1960, Mimeo., L.

390. Klaus, David J. and Lumsdaine, Arthur A. *Self-Instructional Supplements for a Televised Physics Course*. Pittsburgh, Pa., *American Institute for Research*, December, 1959.

391. Klaus, D. J. and Lumsdaine, Arthur A. "Some Economic Realities of Teaching Machine Instruction." Read at the APA meeting, Chicago, 1960.

392. Klausmeier, Herbert J. and Lambert, Philip. "Teaching Machines and the Learning Process," *Educational Leadership*, February, 1961.

393. Klein, Charles and Moon, Harold. "A Topical Index for Teaching Machines and Programmed Learning: A Source Book," *Automated Teaching Bulletin*, 1961, 1, No. 4, 13-15.

394. Kneller, George. "A Critical Analysis of Technology in Education." Read at the APA meeting, New York, 1961.

395. Kneller, George F. *Teaching Machines and Behavior Theory*. University of California, Los Angeles.

396. Koenker, R. H. "Arithmetic Readiness at the Kindergarten Level," *Journal of Educational Research*, 42: 218-223, 1948.

397. Komoski, P. Kenneth. "Automated Teaching Project, Collegiate School." Center for Programmed Instruction. New York, Mimeo., 1960.

398. Komoski, P. Kenneth. Call it "Programmed Instruction" -- not a Teaching Machine," *Mid-Hudson Channel*, 1961, 10, No. 2, 9-13.

399. Komoski, P. Kenneth. "The Collegiate School Conference," *Audio-visual Instruction*, April, 1961.

400. Komoski, P. Kenneth. "Current Development and Experimentation in the Field of Programmed Instruction." Center for Programmed Instruction. New York, Monograph No. 107.

401. Komoski, P. Kenneth. "Origin of Collegiate School Automated Teaching Project." Unpublished report. New York: Collegiate School, 241 W. 77th St., February, 1960, U.

402. Komoski, P. Kenneth. "Programmed Instruction and Its Place in Education." Center for Programmed Instruction. New York, Monograph No. 104.

403. Komoski, P. Kenneth. Programmed Instruction -- Expandable or Expendable? Programmed Instruction, October, 1961, 1, Bulletin No. 2, 3, 6. Center for Programmed Instruction, 365 West End Avenue, at 77th Street, New York 24, New York.

404. Komoski, P. Kenneth. "Programmed Materials." The Nations Schools, February, 1961.

405. Komoski, P. Kenneth. "Programming by Teachers for the School Curriculum." Read at the APA meeting, New York, 1961.

406. Komoski, P. Kenneth. "Teaching Machines and Programmed Reading Instruction." Center for Programmed Instruction: New York, Monograph No. 106.

407. Komoski, P. Kenneth. "Teaching Machines." Answers to your many questions by one of the country's leading authorities. The Instructor, March, 1961, p. 32.

408. Komoski, P. Kenneth. "What are the Schools Doing?" NEA Journal, 1961, 50, 8, 28-30.

409. Kopstein, F. F. and Roshal, S. M. "Learning Foreign Vocabulary from Pictures Versus Words." Unpublished Staff Research Memorandum, Training Aids Research Laboratory, AFPTRC, Air Research and Development Command, Chanute Air Force Base, Ill., November, 1954, U.

410. Kopstein, F. F. and Roshal, S. M. "Method of Presenting Word Pairs as a Factor in Foreign Vocabulary Learning." Paper read at the annual convention of the American Psychological Association, San Francisco, California, September, 1955, U.

411. Kopstein, F. F. and Rockway, M. "Self-Tutoring and Problems in Training." Paper read at the Air Force Office of Scientific Research and the University of Pennsylvania Conference on the Automated Teaching of Verbal and Symbolic Skills, Philadelphia, December, 1958, U.

412. Koronakos, C. "A Comparison of Five Methods of Teaching Basic Reading Skills to the Mentally Retarded." Unpublished Study presented at the Allerton Park Conference on Automation in Special Education, 1960.

413. Kormondy, E. J. Earlham Experiment in Self-Instruction in General Zoology: Preliminary Analyses. Oberlin, Ohio, February, 1960.

414. Kormondy, E. J. Oberlin Experiment in Self-Instruction in General Zoology: Preliminary Analyses. Oberlin College, Oberlin, Ohio, December, 1959.

415. Kowitz, Gerald T. "Administering the Automated School." American School Board Journal, 142: 13-16, 49; February, 1961.

416. Kowitz, Gerald. "Organizational Problems Encountered in the Technology of Instruction." Unpublished paper presented before the Genesee Valley School Study Council, Rochester, New York, University of Rochester, 1960.

417. Kreig, Margaret B. "What About Teaching Machines?" *Parents Magazine*, February, 1961.

418. Kropp, R. P. and Curtis, H. A. "Teaching With Machines." *Florida Education*, October, 1960.

419. Kuhns, Roger J. "Teaching Machines as Viewed by the Electronics Industry." Unpublished paper presented before the American Institute of Graphic Arts, New York, May, 1960.

420. Kvaraceus, William C. "Future Classroom -- An Educational Automat?" *Educational Leadership*, February, 1961.

421. Lange, Phil. "Guide Lines for Appraising the Promise of Teaching Machines." *Mid-Hudson Channel*, 1961, 10, No. 2, 17-18.

422. Larrick, Nancy. "TM -- A Progress Report," *Library Journal*, April 15, 1961.

423. Lasser, S. "The Impact of Visual Aid Displays Showing a Manipulative Task." *Quarterly Journal of Experimental Psychology* 6: 95-106; November, 1954.

424. Lawson, Chester A. "A Suggestion for Programming Teaching Machines." To be published in the Report of the Symposium on Tomorrow's Teaching, Frontiers of Science Foundation of Oklahoma, Indiana, 1961.

425. Leavitt, Jerome E., et al. "Programmed Learning and Teaching Machines." Salem, Oregon: State Department of Education, 1961, Mimeo.

426. Leighton, Frances Spatz. "Remote Control Learning," *The American Weekly*, February 19, 1961.

427. Levine, Stanley L. and Silvern, Leonard C. "The Evolution and Revolution of the Teaching Machine," Parts 1 and 2, *Journal of the American Society of Training Directors*, December, 1960, and January, 1961.

428. Lewis, D. and Shephard, A. H. "A New Device for Presenting Paired-Associates in Verbal Learning." *American Journal of Psychology*, 63: 600-606; October, 1950.

429. Little, J. K. "Results of Use of Machines for Testing and for Drill Upon Learning in Educational Psychology." *Journal of Experimental Education*, 3: 45-49; September, 1934, pp. 59-65.

430. Longridge, Audrey. "An Application of a Teaching Machine in Speech Correction of Children With Articulation Disorders." Unpublished study presented at Allerton Park Conference on Automation in Special Education, 1960.

431. Luce, Gay Gaer. "Can Machines Replace Teachers?" *The Readers Digest*, December, 1960.

432. Luce, Gay Gaer. "Can Machines Replace Teachers?" *Saturday Evening Post*, September 24, 1960.

433. Lumsdaine, A. A. "Audio-Visual Research in the U. S. Air Force." *Audio-Visual Communication Review*, 1: 76-90; Spring 1953.

434. Lumsdaine, A. A. "Design of Training Aids and Devices." *Human Factors Methods for Systems Design*. (Edited by J. D. Folley, Jr.) Pittsburgh: *American Institute for Research*, 1960, L (a).

435. Lumsdaine, A. A. "Improving the Quality of Instruction Through Programmed Learning." Read at the 26th annual conference sponsored by the Educational Records Bureau and the American Council on Education, New York, October, 1961.

436. Lumsdaine, A. A. "Improving the Quality of Instruction Through Programmed Learning." Read at the 26th annual conference sponsored by the Educational Records Bureau and the American Council on Education, New York, October, 1961.

437. Lumsdaine, A. A. *Investigation to Determine Optimal Learning Units and Optimal Presentations for Use With Automated Teaching*. *American Institute for Research*, Pittsburgh, Pa., June, 1960.

438. Lumsdaine, A. A. *Memorandum to Teaching Machine Manufacturers, Prospective Manufacturers, and Publishers or Potential Publishers of Programmed Text Materials*, 1961, University of California, Los Angeles.

439. Lumsdaine, A. A. "New Ideas for Information Inputs at the Work Station." Unpublished paper presented before the San Francisco State College Institute, "Training by Automation in Industry," November, 1960.

440. Lumsdaine, A. A. *Optimal Cueing Methods Applicable to Response Prompting for Automated Instruction*. Description of AFOSR Project, *American Institute for Research*, Pittsburgh, Pennsylvania, June, 1959 (a).

441. Lumsdaine, A. A. "Partial and More Complete Automation of Teaching in Group and Individual Learning Situations." *Automated Teaching: The State of the Art*. (Edited by E. H. Galanter.) New York: John Wiley & Sons, 1959, Chap. 13, pp. 147-66, (a).

442. Lumsdaine, A. A. "Possibilities and Implications of Automated Teaching Methods." Paper read at Symposium on Automation of Teaching at the annual convention of the American Psychological Association, Washington, D. C., August, 1958, U.

443. Lumsdaine, A. A. "Response Cueing and 'Size-of-Step' in Automated Learning Programs." Paper read at Symposium on Research Issues in the Study of Human Learning Raised by Developments in Automated Teaching Methods, American Psychological Association Convention, Cincinnati, Ohio, September, 1959, U (b).

444. Lumsdaine, A. A. "Some Differences in Approach to the Programming of Instruction." *In Programmed Learning: Evolving Principles and Industrial Applications*, 1961, Foundation for Research on Human Behavior, Box 1261, Ann Arbor, Michigan.

445. Lumsdaine, A. A. "Some Issues Concerning Devices and Programs for Automated Learning," 1959, pp. 517-39, (c).

446. Lumsdaine, A. A. "Teaching Machines and Auto-Instructional Programs." *Educational Leadership*, February, 1961.

447. Lumsdaine, A. A. "Teaching Machines and Programmed Individual Instruction." Unpublished paper presented at the meeting of the American Psychological Association in Chicago, 1960.

448. Lumsdaine, A. A. "Teaching Machines and Self-Instructional Materials." *The Education Digest*, December, 1959.

449. Lumsdaine, A. A. "Teaching Machines and Self-Instructional Materials." *Audio-Visual Communication Review*, 7: 163:81; Summer 1959 (Reprinted in this volume with minor changes, under the title "Teaching Machines: An Introductory Overview," pp. 5-22) (d).

450. Lumsdaine, A. A. "Use of Self-Instructional Devices." *Human Factors Methods for System Design*. (Edited by J. D. Folley.) Pittsburgh, Pa.: *American Institute for Research*, 1960, pp. 291-326, L. (c).

451. Lumsdaine, A. A., Butler, F. [illegible], and Meek, C. F. "A Prototype Magazine Loading Sound Film Viewer." Unpublished staff memorandum. Maintenance Laboratory, AFPTRC, 1958, U.

452. Lumsdaine, A. A and Gladstone, A. I. "Overt Practice and Audio-Visual Embellishments." *Learning from Film*. (Edited by Mark A. May and A. A. Lumsdaine.) New Haven, Conn.: Yale University Press, 1958, pp. 58-71.

453. Lumsdaine, A. A. and Klaus, D. J. *What's in a Name? -- A Problem of Terminology.* *American Institute for Research*, Pittsburgh, Pa., June, 1960.

454. Lumsdaine, A. A. and Orr, D. B. *Preliminary Evaluative Studies of Science Telecasts.* Pittsburgh, Pa.: *American Institute for Research*, 1958, L.

455. Lysaught, Jerome P. "A Case Study of Teaching Machine Adaptation." Unpublished paper presented before the Genesee Valley School Study Council, Rochester, New York, 1960.

456. Lysaught, Jerome P. "A Commentary on the State of the Art." *AID*. November, 1961.

457. Lysaught, Jerome P. "The Future Face of Learning." Unpublished paper presented before the Rochester Section, Society of Motion Picture and Television Engineers, Rochester, New York, 1961.

458. Lysaught, Jerome P. Industrial Training Through Programmed Learning. *Personnel Journal*, September, 1961, pp. 165-169.

459. Lysaught, Jerome P. "Programmed Learning and the Classroom Teacher." *New York State Education*, February, 1961.

460. Lysaught, Jerome P. "Programmed Learning and Teaching Machines in Industrial Training," *Journal of the American Society of Training Directors*, February, 1961.

461. Lysaught, Jerome P. "Programmed Learning and Teaching Machines In Industrial Training," Part 2, *Journal of the American Society of Training Directors*, June, 1961.

462. Lysaught, Jerome P. "Teaching Machines and Programming." Unpublished paper prepared for the Industrial Training Departments of the Eastman Kodak Company, Rochester, New York, 1960.

463. Lysaught, Jerome P. and Williams, Clarence M. "A Community Explores Programmed Learning,"Part I, *New York State Education*, February, 1962.

464. Lysaught, Jerome P. and Williams, Clarence M. "A Community Explores Programmed Learning," Part II, *New York State Education*, March, 1962.

465. Maccoby, N. and Sheffield, F. D. "Theory and Experimental Research on the Teaching of Complex Sequential Procedures by Alternate Demonstration and Practice." Symposium on Air Force Human Engineering, Personnel, and Training Research. (Edited by G. Finch and F. Cameron.) Washington, D. C.: National Academy of Sciences -- National Research Council, Publication No. 516, 1958, (Library of Congress Card Catalog No. UG633.S96), pp. 99-107.

466. "Machines for Language Teaching," *School & Society*, November 5, 1960.

467. "Machine Taught Electronics," *Electronics Illustrated*, April, 1961.

468. MacPherson, S. J., Dees, V., and Grindley, G. G. The Effect of Knowledge of Results on Learning and Performance. Parts II, III, *Quarterly Journal of Experimental Psychology*., 1948, 1949, 1, pp. 68-78, pp. 167-174.

469. Mager, Robert F. *Instructional Program Preparation by Specialist Collaboration*. Varian Associates, Palo Alto, California, 1961.

470. Mager, Robert F. *On the Sequencing of Instructional Content*. Varian Associates, Palo Alto,California, 1961.

471. Mager Robert F. Preliminary Studies in Automated Teaching. *IRE Transactions on Education*, June, 1959.

472. Mager, Robert F. What Are Teaching Machines Doing to Teaching? Varian Associates, Palo Alto, California, 1961.

473. Maize, R. C. "Two Methods of Teaching English Composition to Retarded College Freshmen," *Journal of Educational Psychology*, 45: 22-27, 1954.

474. Margolius, G. and Maccoby, N. "Methods of Combining Practice With Filmed Demonstration in Teaching Complex Response Sequences." Paper read at the annual convention of the American Psychological Association, Chicago, Illinois, 1956, U.

475. Margulies, Stuart. "The Industrial Use of Teaching Machines." *Journal of the American Society of Training Directors*, 1961, 15, No. 8, 11-16.

476. Markle, Susan Meyer. "Faulty Frames," *Programmed Instruction*, October, 1961, 1, Bulletin No. 2, 5-6. Center for Programmed Instruction, 365 West End Avenue, at 77th Street, New York, New York 10014.

477. Markle,Susan; Meyer, Imoski; and Kosmoski, Kenneth P. *A Programmed Primer on Programming*. Available from the Center for Programmed Instruction, 365 West End Avenue, at 77th Street, New York, New York 10014.

478. Mathieu, G. *Automated Teaching Bulletin* 1: 5-9; December, 1959.

479. Mathieu, G. "A Brief Guide to Sound Labmanship," *The Modern Language Journal*, February, 1959.

480. Mayer, Joseph. "Progress in Programmed Instruction," *Self Instruction Project*. Earlham College, Richmond, Indiana.

481. Mayer, S. R. *A Method for Studying Aspects of Job Design and Training Requirements of Operators in Computerized Air Defense Systems.* Technical Memorandum, Operational Applications Laboratory Air Force Cambridge Research Center, Bedford, Mass., January, 1959, (OAL-TM-59-1) L.

482. Mayer, S. R. *Use of a Teaching Machine for Air Force On-the-Job Training in the SAGE System*, 1960, Air Force Command and Control Development Division, Report No. AFCCDD-TN-60-51.

483. Mayer, S. R. "Some Problems in the Use of a Teaching Machine for Air Force On-the-Job Training." Unpublished paper presented at the meeting of the American Psychological Association in Chicago, 1960.

484. Mayer, S. R. and Westfield, R. L. *A Field Tryout of a Teaching Machine for Training in SAGE Operations.* Technical Memorandum, Operational Applications Laboratory, Air Force Cambridge Research Center, Bedford, Mass., October, 1958, (OAL-TM-58-16) L.

485. Mayhew, D. J. and Johnson, A. F. "Teaching Machines." *Journal of Engineering Education.* 50: No. 1, 51-52; 1959, pp. 422-24.

486. McClellan, James. *Automated Education: A Philosophical Approach.* Center for Programmed Instruction, New York, Monograph 103.

487. McCrystal, Thomas J. *Programmed Instruction: A Plan For Research.* Research Memorandum, May, 1961, U. S. Army Infantry, Human Research Unit, Fort Benning, Ga.

488. McCullough, Celeste, and Van Atta, Loche. *The Use of Miniature Programs to Supplement Conventional Teaching Techniques*, 1960, Oberlin College, Oberlin, Ohio.

489. McDonnell, G. J. "Automated Teaching". *Growth Stock Review*, No. 31, July, 1960, McDonnel & Co., New York.

490. McKown, H. G. and Roberts, A. B. *Audio-Visual Aids to Instruction.* Second Edition, New York: McGraw-Hill Book Co., 1949.

491. McLuhan, M. "What Fundamental Changes are Foreshadowed in the Prevailing Patterns of Educational Organization and Methods of Instruction by the Revolution in Electronics?" Current Issues in *Higher Education*, 1959. Washington, D. C.: Association for Higher Education, a department of the National Education Association, 1959, pp. 176-82.

492. McNeil, J. D. "The Great Didactic and Automated Teaching." Unpublished paper. Los Angeles: University of California, 1960, U.

493. McNeil, J. D. and Keislar, Evan R. *Individual Differences and Effectiveness of Auto-Instruction on the Primary Grade Level.* University of California, Los Angeles.

494. McPherson, J. M. "Planning Plants and Programs for the New Media," School Life, 43: 20-23, January, 1961.

495. Melaragno, R. J. "Results of Experiment on Negative Reinforcement in Automated Teaching," System Development Corporation, Santa Monica, California, April, 1960.

496. Mellan, I. "Teaching and Educational Inventions," Journal of Experimental Education, 4: 291-300; March, 1936, pp. 265-74.

497. Melton, A. W. "The Science of Learning and the Technology of Educational Methods," Harvard Educational Review, 29: 96-106; Spring 1959, (a).

498. Manger, K. "New Approach to Teaching Intermediate Mathematics," Science, 127: 1320-23; June 6, 1958.

499. Merrill, H. F. "Breakthrough Ahead in Training," The Management News, September, 1960.

500. Meyer, S. R. "A Program in Elementary Arithmetic: Present and Future," Automatic Teaching: The State of the Art. (Edited by E. H. Galanter.) New York: John Wiley & Sons, 1959, Chap. 6, pp. 83-84.

501. Meyer, S. R. "Report on the Initial Test of a Junior High School Vocabulary Program," 1960, pp. 229-46.

502. Michael, D. N. and Maccoby, N. "Factors Influencing Verbal Learning From Films Under Conditions of Audience Participation," Journal of Experimental Psychology, 46: 411-18; December, 1953.

503. Michael, D. N. and Maccoby, N. Some Factors Influencing the Effects of Audience Participation on Learning From a Factual Film. Memorandum Report, Human Resources Research Laboratory, Headquarters Command, Bolling Air Force Base, Washington, D. C., December, 1951, HRRL-MR-13A, L.

504. Mid-Hudson Channel, Vol. 10, No. 2, January, 1961, Issue Theme: "Teaching Machines -- Gadgets or Valuable Timesavers for Teachers?"

505. Miller, N. E., et al. "Graphic Communication and the Crisis in Education," Audio-Visual Communication Review, 5: 1-120; Summer 1957, (Special Issue.).

506. Miller, R. B. Handbook on Training and Training Equipment Design. Wright-Patterson Air Force Base, Ohio; Wright Air Development Center, 1953, WADC Technical Report No. 53-136.

507. Miller, R. B. Psychological Considerations for the Design of Training Equipment, Wright-Patterson Air Force Base, Ohio; Wright Air Development Center, December, 1954, WADC Technical Report No. 54-563.

508. Miller, R. B. *A Study of Methods for Determining Conceptual Content of Technical Jobs for Training Purposes.* Pittsburgh, Pa.: *American Institute for Research,* December, 1955.

509. Miller, R. B. *A Suggested Guide to Functional Characteristics of Training and Training Equipment.* Technical Memorandum, Maintenance Laboratory, AFPTRC, Air Research and Development Command, May, 1956, (ML-TM-56-14.).

510. Miller, R. B. *Task and Part-Task Trainers and Training,* Wright-Patterson Air Force Base, Ohio: Wright Air Development Center, 1956, WADC Technical Report No. 56-41.

511. Mills, Annice L., Editor. *Programmed Learning and the Educational Process.* (The Summary of a Conference held by the Thomas Alva Edison Foundation and Grolier, Incorporated.) The Thomas Alva Edison Foundation, 1961.

512. *MIN/MAX Teaching Machine* -- Teaching Materials Corporation, a Division of Grolier, Incorporated, 575 Lexington Avenue, New York, New York 10022.

513. Mitchell, M. B. Education -- *A New Era Begins.* Reprint of a speech. Chicago: Encyclopedia Britannica

514. Molloy, Julia. "A Language Development Program for Retarded Children." Unpublished study presented at Allerton Park Conference on Automation in Special Education, 1960.

515. Moon, Harold and Klein, Charles. *A Review of Teaching Machines and Programmed Learning: A Source Book.* Automated Teaching Bulletin, 1961, 1, No. 4, 10-12.

516. Moore, O. K. and Anderson, S. B. "Modern Logic and Tasks for Experiments in Problem-Solving Behavior," *Journal of Psychology,* 38: 151-160, 1954.

517. Moore, Walter J. "Promising Leads From Recent Research in Reading." Read at the APA meeting, New York, 1961.

518. Morley, F. P. "A Teaching-Learning Device for Mechanical Drawing," *Industrial Arts and Vocational Education,* 41: 233-34, September, 1952.

519. Morrill, Charles S. "Teaching Machines: A Review," *Psychology Bulletin,* 58, September, 1961.

520. Morse, Arthur D. "Open Minds and Flexible Schools," *Saturday Review,* 43: 27-39; July-September, 1960.

521. Morton, F. R. "The Language Laboratory as a Teaching Machine," *Language Teaching Today.* (Edited by F. J. Oinas.) A report of the Language Laboratory Conference held at Indiana University, January 22-23, 1960. Publication No. 14 of the Indiana University Research Center in Anthropology, Folklore, and Linguistics. (In press, 1960).

522. Mowry, H. W. and Webb, W. B. "Facilitation of Learning by the Classroom Communicator," *Studies in Air Technical Training*. (Edited by H. W. Mowry, W. B. Webb, and E. A. Garvin.) Technical Report prepared for the Office of Naval Research by the Department of Psychology, Washington University, St. Louis, Mo., December, 1955 (Technical Report No. 2, Nonr. 816(02).

523. Murdock, Arthur C. "Let's Try a Learning Machine," *Science Teacher*, April, 1961.

524. Nanas, Ed. "There's a Teaching Machine in Your Future," *Electronics Illustrated*, April, 1961.

525. Nelson, C. W. *The Multiple Purpose Self-Trainer*. Park Forest, Ill.: Management Research Associates, 1945.

526. Nesbit, Paul W. Nesbit's Learning Methods, 1961. *Bulletin No. 1*. Nesbit, 711 Columbia Road, Colorado Springs, Colorado.

527. Nesbit, Paul W. *New Techniques for Efficient Teaching*, 1947, 80 pp. Nesbitt, 711 Columbia Road, Colorado Springs, Colorado.

528. Newman, Fred M. "Teaching Machines: A Primer," *Educational Screen and Audio-Visual Guide*, 40: 25-27; January, 1961.

529. Newman, S. E. "Student Versus Instructor Design of Study Method," *Journal of Educational Psychology*, 48: 328-33; October, 1957.

530. *News in Education*. "Teaching Machines and Texts." Kansas Teacher, November, 1960.

531. Nicod, J. A. "A Reduction in the Number of the Primitive Propositions of Logic," *Proceedings of the Cambridge Philosophical Society*, 19: 34-42, 1916.

532. Nolan, James A. "Influence of Classroom Temperature on Academic Learning," *Automated Teaching Bulletin*, Vol. 1, No. 3, Summer 1960.

533. "Now the Teaching Machine," *United States Review*, pp. 3, 22. November 26, 1960.

534. Nowlis, Vincent M. "The Motivational Aspects of Automated Teaching." Unpublished paper presented before the Genesee Valley School Study Council, Rochester, New York, 1961.

535. Nunn, Gladys. An English Teacher Looks at Programmed Learning. *Audiovisual Instruction*, 1961, 6, No. 9, 441-442.

536. Oakes, W. F. "Use of Teaching Machines as a Study Aid in an Introductory Psychology Course," *Psychological Reports*, 7: 297-303, 1960.

537. O'Brien, Don. "Teaching Machine Experiment in Fire Training," *Fire Engineering*, 1961, 114, No. 1, 27.

538. O'Connor, V. J. "An Examination of Instructional Films for Characteristics of an Effective Teaching Presentation," *Harvard Educational Review*, 20: 271-84; Fall 1950.

539. Ohles, John F. "Approach to Machine Teaching," *School and Society*, 88: 440-1, November 19, 1960.

540. Ojomann, R. H. and Wilkinson, F. R. "The Effect on Pupil Growth of an Increase in Teacher's Understanding of Pupil Behavior," *Journal of Experimental Education*, 8: 143-147, 1939.

541. Olander, C. "A Model for Visualizing the Formula for the Area of a Circle," *Mathematics Teacher*, 48: 245-46; April, 1955.

542. Olds, Robert. *Automated Education*, Ohio Schools, April, 1960, 8-9.

543. Orbison, W. D. "The Relative Efficiency of Whole and Part Methods of Learning Paired-Associates as a Function of the Length of List." Doctor's thesis. New Haven, Conn.: Yale University, 1944.

544. Packer, Dr. R. E. "Education Machines -- A Trend Toward Automated Teaching," *Industrial Research*, February-March, 1961.

545. Pask, G. "Adaptive Teaching With Adaptive Machines," 1960, pp. 349-66. Peins, M. "Mechanical Devices in the Classroom," *Elementary English*, 28: 138-40; March, 1951.

546. Pask. G. "Automatic Teaching Techniques," *British Communications and Electronics*, 4: 210-11; 1957, (a).

547. Pask, G. "Electronic Keyboard Teaching Machines," *Education and Commerce*, 24: 16-26; July, 1958, pp. 336-48, (a).

548. Pask, G. "Report on Symposium Papers at Conference on Automata Held in Tedingham, England," *Automation Progress*, 4: No. 2; circa, 1957, (b).

549. Pask, G. "The Self Organizing Teacher," *Automated Teaching Bulletin*, 1, No. 2,: 13-18; December, 1959 (See Rheem Manufacturing Company.) (a).

550. Pask, G. "The Teaching Machine," *The Overseas Engineer*, February, 1959, pp. 231-32 (b).

551. Pask, G. "Teaching Machines." Unpublished paper. Solartron Electronic Group, Limited, 1958, Mimeo.

552. Pask, G. "A Teaching Machine for Radar Training," *Automation Progress*, 2: 214ff; May, 1957,(c).

553. Pask, G. "Tomorrow's Systems Can Learn from Experience," *Automation Progress*, 4: 44-45, 57; February, 1959, (c).

554. Pearce, Clifford. "Student Reactions to Student Centered Teaching." Read at the APA meeting, New York, 1961.

555. Pens, E. H. *Explanation of the Functional Block Diagrams for Two Self-Instructional Fire Control System Maintenance Trainers*. Technical Memorandum, Maintenance Laboratory, AFPTRC, Lowry Air Force Base, Colorado, December, 1957 (ML-TM-57-17).

556. Peterson, J. C. "A New Device for Teaching, Testing, and Research in Learning," *Transactions of the Kansas Academy of Science*, 33: 41-47; 1930.

557. Peterson, J. C. "The Value of Guidance in Reading for Information," *Transactions of the Kansas Academy of Science*, 34: 291-96; 1931, pp. 52-58.

558. Phillips, Dr. Elias H. "An Appraisal of the Teaching Machine," *Bulletin of the Pennsylvania State School Directors Association*, 25: 32-5; June, 1961.

559. Phillips, E. Lakin. "A Multipurpose Programmed Reading Series." Read at the APA meeting, New York, 1961.

560. Popp, Helen M. and Porter, Douglas. "Programming Verbal Skills for Primary Grades," *Audio-Visual and Communications Review*, August-September, 1960.

561. Porter, D. "A Critical Review of a Portion of the Literature on Teaching Devices," *Harvard Educational Review*, 27: 126-47; Spring 1957, pp. 114-32.

562. Porter, D. "A Report on the Use of Audio-Visual Aids in Foreign Language Instruction." A Report to the Fund for the Advancement of Education, April 16, 1958. Unpublished paper, mimeo.

563. Porter, D. "Some Effects of Year Long Teaching Machine Instruction," *Automatic Teaching: The State of the Art*. (Edited by E. H. Galanter.) New York: John Wiley & Sons, 1959, Chap. 7, pp. 85-90.

564. Porter, D. "Teaching Machines," *Harvard Graduate School of Education Association Bulletin*, 3: 1-5; March, 1958, pp. 206-14, (c).

565. Porter, D. "A Report on Instructional Devices in Foreign Language Teaching." Prepared for International Training and Research Program of the Ford Foundation, October 1, 1958, mimeo., pp. 186-205.

566. Pressey, S. L. "Certain Major Psycho-Educational Issues Appearing in the Conference on Teaching Machines," *Automatic Teaching: The State of the Art*. (Edited by E. H. Galanter.) New York: John Wiley & Sons, 1959, Chap. 16, pp. 187-98.

567. Pressey, S. L. "Development and Appraisal of Devices Providing Immediate Automatic Scoring of Objective Tests and Concomitant Self-Instruction," *Journal of Psychology*, 29: 417-47; April, 1950, pp. 69-88.

568. Pressey, S. L. *Educational Acceleration: Appraisals and Basic Problems*. Bureau of Educational Research Monograph No. 31. Columbus: The Ohio State University, 1949.

569. Pressey, S. L. "Further Attempts to Develop a 'Mechanical Teacher'." Paper read at the annual convention of the American Psychological Association, Philadelphia, September, 1946, U. (Abstracts in the American Psychologist 1 (No. 7); July, 1946.)

570. Pressey, S. L. "The Influence of Color Upon Mental and Motor Efficiency," *American Journal of Psychology*, 32: 326-56; July, 1921.

571. Pressey, S. L. "A Machine for Automatic Teaching of Drill Material," *School and Society*, 25: 549-52; May 7, 1927, pp. 42-46.

572. Pressey, S. L. "A Simple Apparatus Which Gives Tests and Scores -- and Teaches," *School and Society*, 23: 373-76; March 20, 1926, pp. 35-41.

573. Pressey, S. L. "Some History Regarding Self-Instructional Devices." Paper read at Symposium on the Automation of Teaching, American Psychological Association Convention, Washington, D. C., August, 1958.

574. Pressey, S. L. "Some Perspectives and Major Problems Regarding Teaching Machines," 1960, pp. 497-505.

575. Pressey, S. L. "A Third and Fourth Contribution Toward the Coming Industrial Revolution in Education," *School and Society*, 36: 668-72, November 19, 1932, pp. 47-51.

576. Pressey, S. L. and Hanna, D. C. "The Class As a Psycho-Sociological Unit," *Journal of Psychology*, 16: 13-19; July, 1943.

577. Pressey, S. L., Robinson, F. P., and Horrocks, J. E. *Educational Psychology*, New York; Harper & Brothers, 1959.

578. Price, G. R. "The Teaching Machine," *Think*, 25: 10-14; March, 1959.

579. "Principles of Videosonic Systems," Hughes Aircraft Co., March 1, 1961.

580. "Professor Skinner's Teaching Machine," *Fortune*, October, 1958.

581. *Programmed Instruction*. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York, New York 10036.

582. "Programmed Learning," *Time*, 77: 36, 38. March 24, 1961.

583. "Push Button Brains," *Newsweek*, October 26, 1959.

584. "A Radical Experiment in Teaching Elementary Algebra," *School Management*, 4: 64, 65, 68, 69; June, 1960.

585. Ramo, S. "The Impact of Advancing Technology on Methods in Education." Paper read at the annual convention of the American Psychological Association, Cincinnati, September, 1959.

586. Ramo, S. "A New Technique of Education," *Engineering and Science* Monthly, 21: 17-22; October, 1957, pp. 367-81.

587. Ramo, S. "A New Technique of Education," *Institute of Radio Engineers Transaction on Education*, E-1: 37-42; 1958.

588. Rath, G. J.; Andersen, N. S.; and Brainerd, R. C. "The IBM Research Center Teaching Machine Project," *Automatic Teaching: The State of the Art*. (Edited by E. H. Galanter.) New York: John Wiley & Sons, 1959, Chap. 11, pp. 117-30.

589. Raymond, R. C. "The Need for Labor-Saving Machinery in Education." Reprint of a speech. Technical Military Planning Operation, General Electric Company, Santa Barbara, California, February, 1957.

590. Reed, Jerry E. "AID for the Teacher of English," 50: 93-97; February, 1961.

591. Reed, Paul C. "Machines for Your Future?" *Educational Screen and Audio-Visual Guide*, 38: 636; December, 1959.

592. Reed, Watford. Article in the March 2, 1960, *Oregonian* about Dr. Eugene Galanter's speech at the National Association of Secondary School Principals.

593. Reid, L. S. "The Development of Noncontinuity Behavior Through Continuity Learning," *Journal of Experimental Psychology*, 46: 107-12; 1953.

594. Reid, L. S. "A Review of Automatic Teaching: The State of the Art, E. H. Galanter, Editor," *Science*, 131: 29-30; 1960.

595. Renner, Inc. *Inexpensive Missile Training -- A New Approach*. Paper read at the U. S. Navy Guided Missile Training Symposium, Naval Ordnance Laboratory, Whiteoak, Md., March, 1958.

596. "A Report on Two Kinds of Teaching Machines," *School Management*, 4: 61-62, 64; January, 1960.

597. Rheem Manufacturing Company. *Automated Teaching Bulletin*, 1: 1-28; September, 1959.

598. Rheem Manufacturing Company. *Automated Teaching Bulletin*, 2; December, 1959.

599. Rice, Stanley. "Aspects of Teaching Machines in Relation to Educational Publishing." Unpublished paper presented before the American Institute of Graphic Arts, New York, May, 1960.

600. Rickover, Hyman. "Your Child's Future Depends on Education," *Ladies Home Journal*, pp. 98-102, 1960.

601. Rigney, J. W.; Bryan, G. L.; and Svenson, D. W. "The Multiple Choice Item as a Training Device." Paper read at the annual convention of the American Psychological Association, Chicago, September, 1956.

602. Rigney, J. W. and Fry, E. B. *A Survey and Analysis of Current Teaching Machine Programs and Programming*. Technical Report No. 31, Electronics Personnel Research Group, University of Southern California.

603. Riley, Susan B."Mr. Gradgrind and Girl Number Twenty," *NEA Journal*, 1961, 50, 8, 22-25.

604. The Roanoke, Virginia Experiment With Teaching Machines. *Mid-Hudson Channel*, 1961, No. 10, No. 2, 19.

605. Robinson, D. W. "But This a Machine Can Not Do! *California Teachers Association Journal*, 56: 16-17, September, 1960.

606. Robinson, D. and Siegal, J. *Automated Teaching: History, Principles and Applications*, Columbia University, Electronics Research Laboratories, 632 W. 125th Street, New York, New York 10027, Technical Report T-1/158, November, 1960.

607. "Robot Instructors Win Friends and Speed Assembly," *Factory*, November, 1960.

608. Roe, Arnold. *Automated Teaching Methods Using Linear Programs*, Report Nos. 60-53 and 60-105. Automated Learning Research Project, University of California, Department of Engineering. Copies available from author.

609. Roe, Arnold and Case, Harry W. "An Evaluation of Autoinstructional Techniques." Read at the APA meeting, New York, 1961.

610. Roe, Arnold; Lyman, John; and Moon, Harold. "The Dynamics of an Automated Teaching System," *Automated Teaching Bulletin*, 1: 16-25, Spring 1961.

611. Roe, Arnold; Massey, Mildred; Weltman, Gershon; and Leeds, David. *Automated Teaching Methods Using Linear Programs*. Department of Engineering, University of California, Los Angeles, Report No. 60-105, December, 1960.

612. Roe, Arnold and Moon, Harold. "Analysis of Course Content for Individual Learning," *Automated Teaching Bulletin*, Vol. 1, No. 3, Summer 1960.

613. Rogers, C. R. and Skinner, B. F. "Some Issues Concerning the Control of Human Behavior: A Symposium." *Science*, 124: 1057-1066; November 30, 1956.

614. Root, R. T. *An Annotated Bibliography of Research on Training Aids and Training Devices*. Staff Memorandum, Training Methods Division, HumRRO, George Washington University, Washington, D. C., August, 1957.

615. Roshal, S. M. *Effects of Learner Representation in Film-Mediated Perceptual-Motor Learning*. (The Pennsylvania State University) Port Washington, New York, Special Devices Center, Office of Naval Research, 1949. Technical Report SDC 269-7-5.

616. Roshal, S. M. "The Instructional Film." *USAF-NRC, Symposium on Education and Training Media*. (Edited by G. Finch) Washington, D. C., National Academy of Science -- National Research Council, 1960 (In press).

617. Rothkopf, E. Z. "The State of an Art?" (A Review of Automatic Teaching: The State of the Art. Edited by E. H. Galanter.) *Contemporary Psychology*, 5: 104-105; 1960.

618. Rothkopf, E. Z. "Some Research Problems in the Design of Materials and Devices for Automated Teaching." Paper read at Symposium on Automated Teaching at the annual convention of the American Psychological Association, Washington, D. C., August, 1958, pp. 318-28.

619. Rothkopf, E. Z. "Signal Similarity and Optimal Signal Arrangement of Lesson and Drill Orders in Alphabetic Morse Code Training." *Symposium on Air Force Human Engineering, Personnel, and Training Research*. (Edited by G. Finch and F. Cameron.) Washington, D. C. National Academy of Sciences -- National Research Council Publication 516, 1958. (Library of Congress Card Catalog No. UG633-S96) pp. 188-93.

620. Rothkopf, E. Z. "Heuristic Discussions of Psychological Bases for the Conduct of Training by Automatic Devices: I. A. Functional Diagram and an Approach to Research." Unpublished Staff Memorandum, Maintenance Laboratory, AFPTRC, Lowry Air Force Base, Colorado, April, 1957, pp. 305-10.

621. Rothkopf, E. Z. Automated Teaching Devices and a Comparison of Two Variations of the Method of Adjusted Learning. *Psychological Reports*, 1961, 8, 163-69.

622. Rothkopf, E. Z. "Do-It-Yourself Kit for Programmed Instruction," *Teachers College Record*, 62: 195-201; December, 1960.

623. Rothman, Philip. "Pushbutton Pedagogy," *Antioch Notes*, Volume 38, No. 3, November, 1960.

624. Ruark, Henry C. Jr. "Auto-Instructional Devices Alias Teaching Machines," *Oregon Education*, December, 1960.

625. Ruark, Henry C. "Technology and Education," *Phi Delta Kappan*, June, 1961, pp. 387-92.

626. Rufswold, Margaret I. "Library Education and the Newer Media," *ALA Bulletin*, February, 1961.

627. Rufswold, Margaret I. and Guss, Carolyn. *Guides to Newer Educational Media*. American Library Association, 50 East Huron Street, Chicago, Illinois, 74 pp. $1.50.

628. Rushton, E. W. "Greatly Accelerated Learning of Algebra Through Use of Programmed Materials." *The Nations Schools*, February, 1961.

629. Rushton, E. W. "Programmed Learning in the Roanoke, Virginia City School System." Unpublished paper. Dated January 30, 1961.

630. Rushton, E. W. "The Roanoke Experiment." *The Nations Schools*, 67: 76-79; February, 1961.

631. Ryan, T. A. "Multiple Comparisons in Psychological Research," *Psychological Bulletin*, 56: 26-47, 1959.

632. Sakoda, James M. and Wiley, Clarence F. An IBM Card Punchboard. *Psychological Reports*, 1961, 8, 20.

633. Saltzman, I. J. "Comments on Teaching Machines," *Language Teaching Today*. (Edited by F. J. Oinas.) A Report of the Language Laboratory Conference held at Indiana University, January 22-23, 1960. Publication No. 14 of the Indiana University Research Center in Anthropology, Folklore, and Linguistics. (In press, 1960).

634. Saltzman, I. J. "Delay of Reward and Human Verbal Learning," *Journal of Experimental Psychology*, 41: 437-39; June, 1951.

635. Saltzman, I. J. Road Under Construction. (A review of "Statistical Inference: Volume 2 of a Program in Statistics," published by Teaching Machines, Inc. 1960.), *Contemporary Psychology*, 1961, 6 106-109.

636. Sampson, James J. Questions and Answers on Teaching Machines. *Mid-Hudson Channel*, 1961, 10, No. 2, 15-16.

637. Sax, G. "Concept Acquisition as a Function of Differing Schedules and Delays of Reinforcement." Doctor's thesis, Los Angeles: University of Southern California, 1958 (Typewritten).

638. Schaefer, Halmuth H. "A Vocabulary Using 'Language Redundancy'," 1961, University of Pittsburgh, Pittsburgh, Pa. Cooperative Research Project No. 691 (9417), USOE, Title VII NDEA.

639. Schaughency, M. D. "Teaching Arithmetic With Calculators," Arithmetic Teacher, 2: 21-22; February, 1955.

640. "A Schoolman's Guide to Teaching Machines," School Management, October, 1961.

641. Schure, Alexander. "A Case For Automatic Teaching Equipment," Technical Education News, May, 1959.

642. Schutz, R. E. "Progress and Preparation of Automated Instructional Material and Criterion Measures," Automated Teaching Bulletin, 1: 31-33; December, 1959 (See Rheem Califone Corporation). (Also presented at Symposium on Automated Teaching, Western Psychological Association Convention, San Diego, California, April, 1959).

643. Schutz, Richard E. "Shaping Textual Behavior With Kindergarten Children," Read at the APA meeting, New York, 1961.

644. "A Search for a Faster and Better Way to Learn," Dartmouth Alumni Magazine, January, 1961.

645. "Self-Teaching Devices," Carnegie Corporation of New York Annual Report, 1960, 40-41.

646. Seligman, Daniel. "Professor Skinner's Teaching Machine," Fortune, October, 1958.

647. Severin, D. G. "Appraisal of Special Tests and Procedures Used With Self-Scoring Instructional Testing Devices." Abstracts of Doctoral Dissertations, 66: 323-30; 1955, Columbus, The Ohio State University Press.

648. Shafer, Susanne M. "Teaching Machines and the Social Studies," Social Education, February, 1961.

649. Shaw, Archibald B. "TV in Teaching: Tyrant or Tool," Overview, p. 17, February, 1960.

650. Shay, Carleton B. "The Relationship of Intelligence to Step Size on a Teaching Machine," Journal of Educational Psychology, 1961, 52, No. 2, 98-103.

651. Shepard, A. H. and Lewis, D. "A New Device for Presenting Paired-Associates in Verbal Learning," American Journal of Psychology, 63: 600-606; October, 1950.

652. Sidman, M.; Keller, F. S.; Kennedy, E. J.; and Wilson, M. P. "Teaching Morse Code Reception With Signals Weighted in Frequency According Their Difficulty," *Journal of Applied Psychology*, 39: 1-4; February, 1955.

653. Siegel, Arthur I. and Wolf, J. Jay. "A Model for Predicting Two-Man Team Performance in Man-Machine Systems." Read at the APA meeting, New York, 1961.

654. Silberman, H. F. and Coulson, J. "A Draft Summary of Findings in an Exploratory Teaching Machine Study," *Automated Teaching Bulletin*, 1: No. 2, 35-37; December, 1959.

655. Silberman, H. F. "Introductory Description of Teaching Machines (Physical Characteristics)." Paper read at Symposium on Automated Teaching, Western Psychological Association Convention, San Diego, California, April, 1959.

656. Silberman, H. F. "The Automation of Teaching," *Behavioral Science*, 1960.

657. Silberman, H. F. A Computer-Controlled Teaching Machine. 1960. System Development Corporation, Santa Monica, California, TM-532.

658. Silberman, H. F. "Results of Studies on Effectiveness of Automated Instructions." Read at the APA meeting, New York, 1961.

659. Silverman, R. E. *Automated Teaching: A Review of Theory and Research*. Human Engineering Contract No. N61339-507. U. S. Naval Training Devices Center, Port Washington, New York, 1960.

660. Silverman, R. E. "Study Plan for Project 0-4204." Presentation of Information on Teaching Machines. Human Engineering Contract No. N61339-507. U. S. Naval Training Devices Center, 1959 (a).

661. Silverman, R. E. "The Use of Context Cues in Machines." Technical Memorandum. TM-532, System Development Corp., Santa Monica, California, September, 1960.

662. Silverman, R. E. "The Use of Context Cues in Teaching Machines." NAVTRADEVCEN 507-1, U. S. Naval Training Device Center, Port Washington, New York, March, 1960.

663. Silvern, Leonard C. "An Analysis of the Teaching Machine Field and Implications for Home Study Courses," *The Home Study Review*, Winter 1961.

664. Silvern, Leonard C. "Are We Ready for Teaching Machine Curriculums .... Yes!" Hughes Aircraft Company, Culver City, California, 5, 1.2.

665. Silvern, Leonard C. "A Component-Type General Purpose Teaching Machine of Optimum Capability for Curriculum Development." Hughes Aircraft Company, Culver City, California, 5, 6, 27.

666. Silvern, Leonard C. "General and Special Purpose Teaching Machines for Maintenance Training." 1955-65. Read at 2nd National Symposium on Human Factors in Electronics, *IRE*, May, 1961. (Available, Hughes Aircraft Company, Culver City, California, 5.6.14).

667. Silvern, Leonard C. "Implications of the Teaching Machine for Fire Service Training." *Fire Engineering*, 1961, April.

668. Silvern, Leonard C. "The Influence of Teaching Machine Technology on Electronic Systems Maintenance Training." *IRE Transactions on Human Factors in Engineering*, September, 1961.

669. Silvern, Leonard C. "Methods and Devices for Putting an In-Service Training Program in Effect." (Outline of a presentation to the Institute on In-Service Training and Intramural Communication for Supervisors, School of Library Science, University of Southern California, December, 1960) No. 5, 6, 8, Industrial Systems Division, Hughes Aircraft Co., Box 90904, Int. Airport Station, Los Angeles 45, California.

670. Silvern, Leonard C. "Now the Teaching Machine," *Vectors*, 3: 1-5, First Quarter, 1961.

671. Silvern, Leonard C. "Principles and Techniques for Training Programmers," 1961. Hughes Aircraft Company, Culver City, California, 5.6.15.

672. Silvern, Leonard C. "The Teaching Machine for Employee Development," *Personnel Journal*, 39: 413-417, March, 1961.

673. Silvern, Leonard C. "Teaching Machines -- Automation in Education." Informal presentation to the San Fernando Valley State College, May 10, 1961.

674. Silvern, Leonard C. "Uniformity in Teaching Machine Technology," *AID*, May, 1961.

675. Simon, H. A. and Newell, A. "The Stimulation of Human Thought." Paper given at the Current Trends Conference, Pittsburgh, 1959.

676. Skinner, B. F. "Report #1 on the Development of Methods of Preparing Materials for Teaching Machines." Unpublished Report to Human Resources Research Office, January, 1957.

677. Skinner, B. F. "Report #2 on the Development of Methods of Preparing Materials for Teaching Machines." Unpublished Report to Human Resources Research Office, April, 1957.

678. Skinner, B. F. "Final Report to Human Resources Research Office." Unpublished Report to Human Resources Research Office, October, 1957.

679. Skinner, B. F. "Programming Verbal Knowledge for Automated Instruction in Schools and Colleges." Paper read at Symposium on the Automation of Teaching, American Psychological Association Convention, Washington, D. C., August, 1958.

680. Skinner, B. F. "Teaching Machines," *Science*, 128: 969-77, October 24, 1958, pp. 137-58.

681. Skinner, B. F. "Comments on The Impact of Advancing Technology on Methods in Education by Dr. Simon Ramo." September, 1959.

682. Skinner, B. F. "The Programming of Verbal Knowledge." *Automatic Teaching: The State of the Art*. (Edited by E. H. Galanter.) New York: John Wiley & Sons, 1959, Chap. 4, pp. 63-68.

683. Skinner, B. F. "Special Problems in Programming Language Instruction for Teaching Machines," *Language Teaching Today*. (Edited by F. J. Oinas.) A Report of the Language Laboratory Conference held in Indiana University Research Center in Anthropology, Folklore, Linguistics. (In press, 1960).

684. Skinner, B. F. and Holland, J. G. "The Use of Teaching Machines in College Instruction." Final Report to the Fund for the Advancement of Education. August 14, 1958, pp. 159-72.

685. Skinner, B. F. "The Experimental Analysis of Behavior," *American Scientist*, 45: 343-71; September, 1957.

686. Skinner, B. F. "The Science of Learning and the Art of Teaching," *Harvard Educational Review*, 24: 86-97; Spring 1954, pp. 99-113.

687. Skinner, B. F. "Some Contributions of an Experimental Analysis of Behavior to Psychology as a Whole," *American Psychologist*, 8: 69-78; February, 1953.

688. Skinner, B. F. *Science and Human Behavior*, New York: Macmillan Co., 1953.

689. Skinner, B. F. "The Theory Behind Teaching Machines," *Journal of the American Society of Training Directors*, July, 1961.

690. Skinner, B. F. "Why We Need Teaching Machines." Pamphlet, Appleton-Century-Crofts, Inc., 1961.

691. "Skinner Demonstrates Teaching Machines," *Phi Delta Kappan*, 39: 18, October, 1957.

692. Smith, D. E. P. "Speculations: Characteristics of Successful Programs and Programmers," *Automatic Teaching: The State of the Art*. (Edited by E. H. Galanter.) New York: John Wiley & Sons, 1959, Chap. 8, pp. 91-102.

693. Smith, D. E. P. "Teaching Machine," *Michigan Educational Journal*, March, 1960.

694. Smith, Edgar A. and Quachenbush, Jack. "Devereaux Teaching Aids Employed in Presenting Elementary Mathematics in a Special Education Setting," *Psychological Reports*, 1960, 7, 333-336.

695. Smith, Leander W. "An Open Letter On Teaching Machines and Programmed Learning." Read at the Boston University Conference on Secondary Education, April, 1961.

696. Smith, Nila B. "An Experiment to Determine the Effectiveness of Practice Tests in Teaching Beginning Reading," *Journal of Educational Research*, 7: 321-328, 1923.

697. Smith, Robert G. Jr. "Teaching Machines and Programmed Instruction -- Some Factors to Consider in Implementation." Research Memorandum, August, 1961, U. S. Army Air Defense Human Research Unit, HumRRO, Fort Bliss, Texas.

698. Smith, Wendell and Moore, J. W. "Size-of-Step and Achievement in Programmed Spelling." Bucknell University, Mimeo., 1961.

699. Snider, Robert C. "Teaching Machines," *North Dakota Teacher*, April, 1961, (Reprint from Nations Schools, February, 1961).

700. Speer, G. S. "Using Mechanical Devices Can Increase Speed of Reading," *The Nations Schools*, 48: 45-48; October, 1951.

701. Spence, K. W. "The Relation of Learning Theory to the Technology of Education," *Harvard Educational Review*, 29: 84-95; Spring 1959.

702. Standlee, L. S.; Popham, W. J.; and Fattu, N. A. "A Review of Troubleshooting Research." Research Report No. 3 prepared for the Personnel and Training Branch, Psychological Sciences Division. Office of Naval Research by the Institute of Educational Research, Indiana University, December, 1956.

703. Stave, Allan M. "Automatic Programming and Recording in Training Equipment: A Case History and Some Implications." Unpublished paper presented at the meeting of the American Psychological Association, Chicago, 1960.

704. Stein, Jay W. "Machines that Teach Better Than Books?" *College and Research Libraries*, May, 1961.

705. Stein, Jay W. "Multiple Choice on Teaching Machines," *Overview*, 1: 74-76; June, 1960.

706. Stein, Jay W. "Schizophrenia in Becoming Educated," *School and Society*, 88: 461-63; December 3, 1960.

707. Stephens, A. L. "Certain Special Factors Involved in the Law of Effect." *Abstracts of Doctoral Dissertations*. Columbus: The Ohio State University Press. No. 64, 1953, pp. 89-93.

708. Stevens, Kimble. "New Miracle Way to Learn Anything Fast," *Pageant*, pp. 140-145, October, 1960.

709. Stevens, Kimble. "Square Like Crazy in 4 Minutes," *Pageant*, May, 1961.

710. Stevens, Traxel. "The Look of Things to Come," *The Texas Outlook*, June, 1961.

711. Stoddard, A. J. "Schools for Tomorrow." New York: The Fund for the Advancement of Education, 1957.

712. Stolurow, L. M. "Automated Teaching of Sight Vocabulary." Read at the APA meeting, New York, 1961.

713. Stolurow, L. M. "Automation in Special Education," *Exceptional Children*, 27: 78-83; October, 1960.

714. Stolurow, L. M. "Problems in Evaluating Automated Instruction," *Teacher College Record*, October, 1961, 63, No. 1, 66-70.

715. Stolurow, L. M. *Teaching by Machine*. University of Illinois, Urbana, Illinois, September, 1960.

716. Stolurow, L. M. "Teaching Machines and Special Education," *Educational and Psychological Measurement*, 20: 429-49; Autumn 1960.

717. Stolurow, L. M. "Teaching With Machines." Paper presented at 99th Annual Convention of the Missouri State Teachers Association, St. Louis, Mimeo., 1961.

718. Stolurow, L. M. and West, Leonard J. "Teaching Machines and Self-Instructional Programming," *The Delta Pi Epsilon Journal*, 1961, 3, No. 3, 1-27.

719. Stone, C. Walter. "The Crisis in Education -- A Mandate for Librarians," *ALA Bulletin*, February, 1961.

720. Stone, G. R. "The Training Function of Examinations: Retest Performance as a Function of the Amount and Kind of Critique Information." Lackland Air Force Base, Texas, Air Force Personnel and Training Research Center, June, 1955. Research Report AFPTRC-TN-55-8.

721. Sturwold, Virginia G. "Sources of Self-Instructional Devices," *Audiovisual Instruction*, April, 1961.

722. Swanson, R. A.; Lumsdaine, A. A.; and Aukes, L. E. "Two Studies in Evaluation of Maintenance Training Devices." Symposium on Air Force Human Engineering, Personnel, and Training Research. (Edited by G. Finch and F. Cameron.) Washington, D. C.: National Academy of Sciences -- National Research Council. Publication 455, 1956. (Library of Congress Card Catalog No. 56-60063) pp. 267-75.

723. Symonds, P. and Chase, D. H. "Practice vs. Motivation," *Journal of Educational Psychology*, 20: 19-35; January, 1929.

724. Taber, Julian II, and Glaser, R. "An Exploratory Evaluation of a Discriminative Transfer Learning Program Using Literal Prompts," 1961. University of Pittsburgh, Pittsburgh, Pa., Cooperative Research Project No. 691 (9417), USOE, Title VII, NDEA.

725. Taris, C. M. "Automatic 'Answer Only' Set." *Bell Laboratories Record*, 34: 165-58; May, 1956.

726. "Teaching Machine Experiment in Fire Training," *Fire Engineering*, January, 1961.

727. "The Teacher in the Automatic Box," *Overview*, June, 1961.

728. "Teachers for Tomorrow," *Bulletin Number 2*, The Fund for the Advancement of Education, p. 40, 1955.

729. "The Teaching Machine," *Education Summary*, March 27, 1960.

730. "Teaching Machine," *The New York Times*, October 11, 1960.

731. "The Teaching Machine for Employee Development," *Personnel Journal*, March, 1961.

732. "Teaching Machines," *Bulletin of the Florida State Teachers Association*, June, 1961.

733. "Teaching Machines," *The Indiana Teacher*, November, 1960.

734. "The Teaching Machines," *Time*, November 7, 1960.

735. "Teaching Machines and Texts in News in Education," *Kansas Teachers*, November, 1960.

736. "Teaching Machines: An Old Technique in a New Setting." Pittsburgh, Pa., School District No. Six Principals' Study Group.

737. "Teaching Machines Are a Threat to Teachers," *School Management*, 4: 41-43, December, 1960. (Interview with Norman A. Crowder by the editors of *School Management*.).

738. "Teaching Machines: For Brighter Students?" *Newsweek*, August 17, 1959.

739. "Teaching Machines Permeate Convention Sessions," *Audio-Visual Instruction*, June, 1961.

740. "Teaching Machine Technology." Presentation to Quarterly Training Seminar, 2563rd Air Reserve Center, USAF, May, 1961. (Available, Hughes Aircraft Company, Culver City, Calif., 5, 6, 25).

741. Thompson, G. G. and Hunnicutt, C. W. "The Effect of Praise or Blame on the Work Achievement of 'Introverts' and 'Extroverts'." *Journal of Educational Psychology*, 35: 257-266, 1944.

742. Thompson, W. C. "A Book Versus Machine Experiment in Adult Reading Improvement," *College English*, 15: 471-73; May, 1954.

743. "Tireless Tutor," *New Yorker*, Feb. 13, 1960.

744. "Tools for Education," *Overview*, p. 74; February, 1960.

745. "Training Research Abstracts," Vol. 1, No. 1, January, 1961, American Society of Training Directors, 2020 University Avenue, Madison 5, Wisconsin.

746. Traxler, A. E. "Value of Controlled Reading: Summary of Opinion and Research," *Journal of Experimental Education*, 11: 280-92; June, 1943.

747. Trump, J. "Images of the Future." Washington, D. C.: National Association of Secondary-School Principals, a department of the National Education Association, 1959.

748. Trump, J. Lloyd. "Images of the Future for School Libraries," *ALA Bulletin*, February, 1961.

749. Tucker, Dr. Joseph A., Jr. "Intrinsic Programming: A Simulation Technique." Unpublished paper presented before the San Francisco State College Institute, "Training by Automation in Industry," November, 1960.

750. Tutor Text, Sample Sequence; Western Design, Santa Barbara, Calif.

751. Twyford, L. C. "Profile Techniques for Program Analysis," *Audio-Visual Communication Review*, 2: 243-61; Fall 1954.

752. Twyford, L. C.; O'Hara, J. G.; and Goldman, A. "Green Light Rater." Port Washington, New York; U.S. Naval Training Device Center. December 23, 1958, 5 p. Technical Report NTDC 20-OS-3-1.

753. Underwood, B. J. "Verbal Learning in the Educative Process." *Harvard Educational Review*, 29; 107-17, Spring 1959.

754. Underwood, B. J. "Verbal Learning in the Educative Process," *Harvard Educational Review*, 29: 107-17; Spring 1959.

755. U. S. Air Force. Air Force Personnel and Training Research Center. Index to Air Force Personnel and Training Research Center. Technical Documentary Reports, 1957 and 1958. Lackland Air Force Base, Texas: The Center, March, 1958.

756. U. S. Department of Defense, Research and Development Board, Committee on Human Resources, Panel on Training and Training Devices. Symposium on Psychology of Learning Basic to Military Training Problems, May 7-8, 1953.

757. U. S. Department of Health, Education and Welfare. Annual Report of the U. S. Department of Health, Education, and Welfare: 1953, Washington D. C.: Superintendent of Documents, Government Printing Office, 1953.

758. The U. S. Navy, Special Devices Center, Office of Naval Research. Instructor's Guide for Tester-Rater, Self-Tutoring Punchboard. Port Washington, New York: The Center, July, 1954.

759. Van Atta, L. and McCollough, C. "The Use of Miniature Programs to Supplement Conventional Teaching Techniques." Unpublished paper presented at the meeting of the American Psychological Association, Chicago, 1960.

760. Van Valkenberg, Nooger and Neville, Inc., (copyright holder). *Trouble Shooting Trainer Tester*. New York, 1954.

761. Vennum, Margaret, "Book Learning Ain't What it Used to be!" *Better Homes and Gardens*, 1961, 39, No. 12, 16-26.

762. Verplanck, W. S. "A Glossary of Some Terms Used in the Objective Science of Behavior." Supplement to the *Psychological Review*, 64: November, 1957.

763. Viteles, M. S. *Psychological Principles in the Design and Operation of Synthetic Trainers."* Memorandum 19, Project N-105. Philadelphia: University of Pennsylvania, 1945.

764. Votaw, D. F. and Danforth, L. "The Effect of Method of Response Upon the Validity of Multiple-Choice Tests," *Journal of Educational Psychology*, 30: 624-27; November, 1939.

765. Wahgren, Hardy L. "Student Reaction to a Self-Tutoring Introduction to a Science of Human Behavior." Read at the APA meeting. New York, 1961.

766. Waller, Theodore. "Teaching Machines and School Libraries," *Library Journal*, April 15, 1961.

767. Warren, A. B. and Brown, R. H. "Conditioned Operant Response Phenomena in Children," *Journal of General Psychology*, 28:

768. Warren, N.; Atkins, D. W.; Ford, J. S.; and Wolbers, H. L. "Development of a Training Program for Teaching Basic Principles of Trouble Shooting." Technical Memorandum, Armament Systems Personnel Research Laboratory. AFPTRC, Lowry Air Force Base, Colorado, October, 1955 (ASPRL-TM-55-19).

769. Weaver, David O. "Suggested Techniques in Preparing Programmed Learning: The Elements of 'How to' for Linear Programming," The Journal of the American Society of Training Directors, May, 1961.

770. Weimer, P. K. "A Proposed 'Automatic' Teaching Device," Institute of Radio Engineers Transactions on Education E-1: 51-53; June 1, 1958, pp. 311-17.

771. Weisenberg, Charles M. "Teaching Machines," The Commonweal, January 27, 1961.

772. Weiss, Edward C. and Wulff, J. Jepson. "Development and Evaluation of an Automated Tutoring Course for On-Site Training of Maintenance Technicians," 1960, Psychological Research Associates, Inc., Arlington, Virginia.

773. Wermuth, Paul C. "Gee Whiz -- or, TV Looks at Education," School and Society, pp. 265-66; Summer 1961.

774. West, L. J. "Teaching Machines: New Classroom Aids," Southern Illinois Business Journal, Summer 1960.

775. "The Western Design Tutor," Western Design, Santa Barbara, Calif.

776. "What Is a Teaching Machine?" Teaching Materials Corporation, A Division of Grolier, Incorporated, 575 Lexington Avenue, New York, New York 10022.

777. "What Is the Potential of Audiovisual Devices?" Audio-Visual Instruction, June, 1961.

778. Wigren, Harold E. "Media for Tomorrow's Schools," Educational Leadership, May, 1960, 495-502.

779. Willey, Clarence F. "A Completion Item Teaching Machine for Routine Classroom Use," Psychological Reports, 1960,6, 89-90.

780. Willey, Clarence F. "Classroom Scoring of Tests," Psychological Reports, 4: 611-17; December, 1958.

781. Willey, Clarence F. "IBM Punchboard Construction Item Self-Teaching." Read at the APA meeting, New York, 1961.

782. Willey, Clarence F. "IBM Punchboard Response Coding." (Read at Vermont Psychological Association Annual Meeting, Windham College, April, 1961.) Department of Psychology and Education, Norwich University.

783. "Will Teaching Machines Revolutionize Education?" *Michigan Education Journal*, December 1, 1960.

784. Williams, Clarence. "How to Individualize Instruction Through Automated Teaching." Unpublished paper presented before the Genesee Valley School Study Council, Rochester, New York, 1960.

785. Winebrenner, D. K. "Automation and Education," *School Arts*, November, 1957.

786. Witcher, C. M. "The Teaching of Mathematics to the Blind," *Mathematics Teacher*, 48: 314-21, May, 1955.

787. Wittich, Walter A. "New Key to Learning: The Mechanized Tutor," *College and University Business*, February, 1961.

788. Wittich, Walter A. "Teaching Machines: Practical and Probable," *The Nations Schools*, August, 1960.

789. Wolfle, D. "The Use and Design of Synthetic Trainers for Military Training." Washington, D. C., Applied Psychology Panel, OSRD, 1946. OSRD Report 5246.

790. Woodworth, R. S. "A Contribution to the Question of 'Quick Learning, Quick Forgetting'." *Psychological Bulletin*, 11: 58-59; 1914.

791. Wulff, J. J. "Specifications for a Paired-Associate Trainer." Unpublished Staff Memorandum, Maintenance Laboratory, AFPTRC, Lowry Air Force Base, Colorado, December 6, 1957.

792. Wyckoff, L. B. "The Role of Observing Responses in Discrimination Learning," *Psychological Review*, 59: 431-32, 1952.

793. Yale Motion Picture Research Project. "Do Motivation and Participation Questions Increase Learning?" *Educational Screen*, 26: 256ff; May, 1947.

794. Young, Jay A. "Programmed Instruction in Chemistry," *Journal of Chemical Education*, 1961, 38, 9, 463-465.

795. Young, Lewis H. "The Coming Boom in Teaching Machines," *The Home Study Review*, Summer 1960.

796. Zeaman, D. "Comments on the Automation of Teaching." Presented at Symposium on the Automation of Teaching. American Psychological Association Convention, Washington, D. C., August, 1958.

797. Zeaman, D. "Skinner's Theory of Teaching Machines," *Automatic Teaching: The State of the Art*." (Edited by E. H. Galanter.) New York: John Wiley and Sons, 1959. Chap. 14, pp. 167-76.

798. Zeaman, D. "Teaching Machines," *Grade Teacher*, September, 1960.

799. Zschokke, T. L. "Mr. Brain Helps in Classroom," *California Teachers Association*, J.56: 13, September, 1960.

800. Zuckerman, Carl. "Study Plan for Research in the Automation of Teaching." U. S. Naval Training Devices Center. Human Engineering Contract No. N61339-661, 1959.

801. Sidowski, J. B.; Lopstein, F. F.; and Shillestead, Isabel J. "Proposal for an Experiment to Examine the Influence of Several Factors on the Efficacy of a Prompting versus a Confirmation Procedure in Programming." 59-1, Wright Air Development Center, August, 1959.

APPENDIX B

Partial Listing of Schools and Organizations Pursuing Some Aspect of Communication-Linked Classroom Techniques Deemed Worthy of Site Visit During Evaluation Program.

1) The Catholic Diocese of Brooklyn and the International Business Machines Corporation have joined together and are cooperating on a telephone link computer experiment designed to make homework easier. Six high school students have been selected for the experiment. They have their push button phones linked to the computer. By pushing buttons the students can tell the computer to add, subtract, multiply divide or do the square root. The computer gives the answer by voice using voice answer-back control. The answer-back operates much like a phonograph record or pre-recorded tape.

The computer is located at the IBM Center in Yorktown, New York, fifty miles away from the student's home. The computer, in effect, gives each student an equivalent of a versatile desk calculator in his own home.

Brother Austin David, FSC, is the data processing consultant for the Diocese. He sees computers as a vital educational tool for reviewing class work of the day, aiding teachers in expanding horizons of their courses and even for teaching complete courses on their own when linked to push button phones.

2) The IBM 7090 Computer is being used in a Yorktown experiment with two dozen sixth grade children. The children are completing the experiment in computerized learning that began in October, 1965. The computer is linked with a special typewriter keyboard and has been successful in teaching economics to a sixth grader, the report indicates. Lessons are supervised by Northern Westchester County's Board of Cooperative Educational Services, a federation of school boards. Dr. Richard L. Wing, Project Director, calls the experiment a means of showing "that you really can teach children this way, even though field of computer teaching is just at its very beginning." The project is financed by funds provided by O.E.

3) Computers are being used in the Palo Alto, California school system at the Brentwood School starting this next fall. The 170 first graders are to be taught by computers in an experiment directed by Dr. Suppes at Stanford University's Institute for Mathematics. The Palo Alto experiment is of special significance since eighty percent of Brentwood School pupils are negro, mostly from deprived homes.

The experiment will use 16 consoles connected to a computer. Four modes of teacher-student response will be built into each console - a TV screen, typewriter, screen and headset. The child will receive spoken instructions via the headset, will be told by pre-recorded voice when the answers are correct and will be guided to correct answers. The system also will flash slides on the screen while voices ask their meaning. The child will be able to communicate with the computer through a beam of light flashed on a TV screen, Penlight, by microphone and typewriter, although use of the typewriter is limited by the age of the learners. The computer to be used here is the IBM 1500.

4) In another development, the Systems Development Corporation of Santa Monica, California has been awarded a $26,000 grant by the State of Kentucky to provide technical assistance in establishing vocational education data-processing center. Computer base system will furnish officials, the State Bureau of Vocational Education, with information needed to plan and monitor comprehensive vocational education programs.

5) Oakland Community College, Bloomfield Hills, Michigan. The Oakland Community College effort began on September 7, 1965, on two campuses located in Oakland County, Michigan, with an enrollment of approximately 3800 full-time students.

The objective of the college was to begin, simultaneously, a multitract, academic and technical educational program accommodating the needs of individual students with unique educational objectives and different pre-requisite skills. OCC has attempted to develop an instructional approach which is primarily learner centered. Although, at present, there is not a computer,their plans are to install one. They have drawn heavily on the work of Dr. S. N. Postlethwaite of the Botany Department of Purdue who has developed what he calls the Audio-Pictorial Method and the instructional systems approach which has been developed by the Litton Industries and the group pictorial methods of Dr. Robert Corrigan.

There are no formal classrooms at OCC and, therefore, no live assemblages of any scope or extent. They have developed learning laboratories which house study carrels rather than traditional student chair-desks. The students never do assemble in a lock step manner. While in the learning laboratories itself tutors are available to answer questions and offer other help on a one-to-one basis. Plans are being made for the extensive use of a variety of media. At present the dependence is largely on audio tapes, although there is not a dial access system as there is at Oklahoma Christian College.

6) University of Wisconsin's Articulated Instructional Media Program, Madison, Wisconsin. This program is keeping close tabs on dial access information retrieval systems. AIM has been publishing a Dial Access Information Retrieval System Bulletin. The first issue was published in July 1965.

7) A Dial Access System has been installed at Punahou School, Honolulu, Hawaii, for 3400 students, Grade K through 12. This is the largest private college preparatory school in the United States. The school also contains a visual production center which is available with equipment for teachers to produce or have produced for them overhead transparencies, 35 mm slides, graphs, charts plus posters, dry mounts, color lifts, laminations, duplicate and facsimile reproductions, copies of anything - 1 to 1,000, filmstrips, 16 mm motion pictures, enlargements or reductions from books or magazines, duplicates, slides, etc. The media learning center, adjacent to the library stacks provides eight visually and accoustically-treated carrels for student use. The carrels are equipped for use with non-book materials including record player, slide or filmstrip projector, audio-type recorder, 16 mm film projector, microfilm reader and a reader printer. Each of these carrels is also equipped with Dial Access and three sets of earphones. The listening center with 38 individual student carrels provides random access, digital dialing to anyone of the 30 audio program sources. This particular center is NOT used for foreign language drills. There are two other language laboratories located in another building for that purpose. The listening center is designed to be used for supplementary and assigned learning in all areas of the curriculum. The greatest utilization has been in the areas of foreign languages (not drill), social studies, english and music.

8) Dial access system at Oklahoma University is one put in there by North Electric at Galion, Ohio. Eaah student has his own carrel during the semester for which he pays $30 rent. There are 606 carrels presently assigned for the students during the present. The students average four hours per day in the carrel. This indicates that most of the day the carrels are not being used and, therefore, one would want to question the desirability of assigning one student per carrel even at a rental fee of $30 per semester. The system at Ohio State has 267 carrels for 35,000 students.

The system indicated there was an increase of 75% of library usage over last year which they attribute largely to the dial access system. The dial is largely to tape recorded materials which include recorded lectures prepared by teachers along with workbooks which:

A. The teacher prepares to include visuals so the system is looked upon as a tape-workbook method. The vision is made in the workbooks for encouraging students to take notes.

B. The materials also include recorded programmed instruction materials.

C. Recorded exercises.

D. Recorded source materials, for example, music, drama, etc.

9) Oral Roberts College at Tulsa, Oklahoma, has 130 carrels, one half of which are wired already for video outlets and plan to use the slow scan system - this is all dial access.

10) The cost per booth at Oklahoma Christian College is $1,000 which includes the central computer. A plan for this program was under Title VII, Part B. Under this particular title the Oklahoma Christian College has been given a Grant to disseminate information regarding dial access.

11) The Bedford Public Schools, Bedford, New York, are working on a project concerning the definition of the processes necessary to develop the independent learner and also the processes necessary to bring about the desired changes in teacher roles and strategies to assure the appropriate use of a dial access video system.

12) Oak Park and River Forest High School, Oak Park, Illinois, will be working on a project that will investigate the feasibility of a library-located Instructional Resource Center which will be capable of electronically storing vast amounts of information (audio and visual) and making that information instantly retrievable for individual or small group instruction, at a cost which will permit public and private schools to develop centers on their own.

13) The Pennsylvania State University has had a project approved to expand its system from a language laboratory to a listening center which will serve all subject areas. This will be similar to the Listening Center at Ohio State University.

14) Educasting, Inc., WFIL-FM, Philadelphia (Station owned by radio and television division of Triangle News of New York - Triangle owns 5 FM outlets in Philadelphia, Birmingham, New Haven, Fresno and Altoona, Pa.)

This particular set-up permits two-way transmission between FM stations and a special, small receiving unit without interfering with regular station programming.

15) International Correspondence Schools, Inc. of Scranton, Pa., which is programming instructional materials, has joined forces with Educasting. The present Educasting system utilizes a small receiver equipped with four stations (A-B-C-D). A student equipped with a receiver may push a button permitting him to communicate verbally with the transmitter. This system is adaptable with TV as well as FM radio.

16) The President of International Correspondence Schools, John C. Villihune, sees a need to produce textual materials which will probably be workbooks to go with the courses. The receiving unit, which will be given to each one enrolling in the course, is developed by Sylvania Electric Products, Inc. The FM stations will broadcast the courses under a lease arrangement.

17) The Oakleaf Elementary School, Pittsburgh, Pa., project going on for two years, was developed under an Office of Education grant, University of Pittsburgh laboratory under Robert Glaser. There are no grades, lectures, or textbooks used in this school, in the usual sense, and children work at their own pace with the aid of tape recorders, special worksheets and there are plans for the installation of a computer-assisted instruction facility.

18) University Adult High School, Los Angeles, California. Here an experimental system is being followed offering students who are willing to work an opportunity to obtain an adequate education in a minimum time and at a minimum cost through programmed materials. The Principal of the school, at the time when programmed education was being introduced into the system, was William R. Hathaway. The present Principal is Abram Friedman.

19) Bell Hall, New Academic Bldg; Location: USAC & GSC, Ft. Leavenworth, Kansas; Contacts: Major Robert M. Olsen, Supply Officer - Dr. Ivan J. Birrer, Educational Advisor.

20) SCSD Modular Bldg. (flexible - adaptable), Team Teaching, Team Administration, Acoustical Floor Treatment, Operable Partitions, Demountable Interior Walls; Location: Barrington Middle School, District 4 and District 224, Admin. Offices: 820 South Northwest Highway, Barrington, Illinois 60010; Contacts: Dr. Robert M. Finley, Superintendent - Mr. Walter M. Pagels, Principal - Mrs. Eldred G. Gough, Tour Hostess.

21) New Academic Bldg., Instructor-Controlled CCTV; Location: U. S. Air Force Academy, Colorado Springs, Colorado; Contacts: Major H. B. Hitchins, Director, Audio-Visual Dept., - Captain Michael Brooks, Liaison Officer, Expansion Program.

22) SCSD Prototype Modular Bldg.; Location: School Construction Systems Development, 770 Pampas Lane, Stanford, California; Contacts: Mr. Ezra D. Ehrenkrantz, Project Architect - Mr. John Boyce, Mr. Carl Bryant.

23) Modular Bldgs., Acoustical Floor Treatment; Location: Bertha Ronzone Elementary School, Southern Nevada Vocational Technical Center, A. W. Clark High School, Clark County School District, Las Vegas, Nevada 89101; Contacts: Dr. Marvin B. Wampler, Director, Dept. of School Facilities - Mr. Kenneth Guinn.

24) Underground Bldg.; Location: Robert H. Goddard High School, Roswell, New Mexico; Contacts: Mr. H. F. Allred, Superintendent- Mr. Ernest Traylor, Principal.

25) Underground Bldgs.; Location: Abo Elementary School, Park Junior High School, Artesia, New Mexico; Contacts: Dr. L. R. Westfall, Superintendent - Mr. Dean Robinson, Principal, Abo Elementary School - Mr. John Daugherty, Principal, Park Junior High School.

26) Electronic Classrooms, CCTV, Large-Group Instruction, Student Response System; Location: Learning & Instructional Resources Center, University of Miami, Coral Gables, Florida; Contact: Mr. Roy J. Johnson, Director.

27) New University, Electronic Classrooms, Language Laboratory, Elaborate CCTV Facility, Computer-Based Library, Individualized Instruction, Large-Group Instruction; Location: Florida Atlantic University, Boca Raton, Florida; Contact: Dr. Myron R. Blee, Associate Dean of Academic Affairs.

28) New Academic Bldg.; Location: U. S. Army Infantry School, Fort Benning, Georgia; Contacts: Lt. Col. Frank L. Lillyman, Deputy Operations Officer - Dr. Harold S. Tate, Educational Advisor.

APPENDIX C

LIST OF CANDIDATES FOR ADVISORY PANEL

NAME	AFFILIATION
Robert Luke	National Adult Education Association
Dr. Al Canfield	Oakland Community College
Dr. Sam Beskin	Antioch College
Dr. Robert Glaser	University of Pittsburgh
Dean Roy Woolridge	Northeastern University
Dr. Alexander Schure	N.Y.I.T. (Chairman)
Dr. Gabriel Ofiesh	Catholic University
Dr. David Salten	Federation of Jewish Philanthropies
Dr. Gerald Somers	University of Wisconsin
Dean Lindley Styles	Northwestern University
Dr. Joseph Weil	University of Florida
Dr. C. Ray Carpenter	Pennsylvania State University
Dr. Donald Stewert	Texas A & M College
Dr. Lester Greenhill	Pennsylvania State University
Dr. Robert Snider	DAVI - NEA
Rt. Rev. Msgr. Eugene Kevane	Catholic University
Dr. Anna Heyer	DAVI - NEA
Dr. Desmond Wedburg	University of Maryland
Dr. William Deterline	General Program Teaching, Inc.
Dr. James D. Finn	University of Southern California
Roger C. Greenhalgh	IBM

Subject: Preliminary Investigation of Communication-Linked Techniques for Off-Campus Teaching of Vocational and Technical Subjects. U. S. Office of Education Grant No. OEG-1-6-08254-0819

Dear

Under the subject grant we have prepared a detailed plan for a nation-wide survey of advanced educational techniques in experimental or regular use in schools, colleges, universities, industrial organizations and government agencies. A draft copy of this plan is enclosed.

As noted in the plan, we propose to catalogue the techniques and equipment encountered in the survey and we propose to summarize such reports of findings as may be available in connection with experimental or regular programs utilizing these techniques and equipment. We would hope to evaluate the significance of the various techniques with particular attention to the implications for vocational and technical education.

When and if the U. S. Office of Education approves the plan and authorizes the survey, we should like to establish a panel of expert consultants who would assist in the evaluation and interpretation of the findings of the survey. Panel members would counsel with us on various aspects of the work but the panel would not necessarily have to convene as a body. Appropriate remuneration and expense reimbursement would be provided for all consulting services in connection with this project.

I should like to invite you cordially to serve on this panel of consultants and to participate in this significant survey of the state of the art of modern educational technology. A list of the invitees is enclosed for your information. I shall look forward with pleasure to your reply and I hope that you will find it possible to serve on the panel.

Cordially,

Alexander Schure

Alexander Schure
President

AS:mo
Encl.

APPENDIX B

Location and Type of Schools Visited

The five schools visited were all two-year post high school institutions offering technical programs. One was in Massachusetts, two in New York State, one in Wisconsin and one in California. One was private, four were public, three had sharply defined admission policies and two were open to all high school graduates. The smallest had fewer than five hundred students and the larger ones had enrollments over 2,000. Two had about 1,000 students.

Three of the institutions offered trade curriculums in addition to the technical. Technical programs offered included health, business and engineering related curriculums.